Sedimentology of Arctic Fjords Experiment: HU 83-028 Data Report, Volume 2

Compiled by J.P. Syvitski

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Canadian Data Report Of Hydrography and Ocean Sciences

These reports provide a medium for the documentation and dissemination of data in a form directly useable by the scientific and engineering communities.

Generally, the reports will contain raw and/or analyzed data but will not contain interpretations of the data. Such compilations will commonly have been prepared in support of work related to the programs and interests of the Ocean Science and Surveys (OSS) sector of the Department of Fisheries and Oceans.

Data Reports are produced regionally but are numbered and indexed nationally. Requests for individual reports will be fulfilled by the issuing establishment listed on the front cover and title page. Out of stock reports will be supplied for a fee by commercial agents.

Regional and headquarters establishments of Ocean Science and Surveys ceased publication of their various report series as of December 1981. A complete listing of these publications and the last number issued under each title are published in the *Canadian Journal of Fisheries and Aquatic Sciences*, Volume 38: Index to Publications 1981. The current series began with Report Number 1 in January 1982.

Rapport statistique canadien sur l'hydrographie et les sciences océaniques

Ces rapports servent de véhicule pour la compilation et la diffusion des données sous une forme directement utilisable par les scientifiques et les techniciens.

En général, les rapports contiennent des données brutes ou analysées mais ne fournissent pas d'interprétations des données. Ces compilations sont préparées le plus souvent à l'appui de travaux reliés aux programmes et intérêts du service des Sciences et Levés océaniques (SLO) du ministère des Pêches et des Océans.

Les rapports statistiques sont produits à l'échelon régional mais sont numérotés et placés dans l'index à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page de titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Les établissements des Sciences et Levés océaniques dans les régions et à l'administration centrale ont cessé de publier leurs diverses séries de rapports depuis décembre 1981. Vous trouverez dans l'index des publications du volume 38 du *Journal canadien des sciences halieutiques et aquatiques*, la liste de ces publications ainsi que le dernier numéro paru dans chaque catégorie. La nouvelle série a commencé avec la publication du Rapport n° 1 en janvier 1982.

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ABSTRACT

Syvitski, J.P.M. (Compiler) 1984. Sedimentology of Arctic Fjords Experiment: HU 83-028 and HU 82-031 data report, Volume 2. Can. Data Rep. Hydrogr. Ocean Sci. No. 28: 1130p.

This is the second series of reports on the "Sedimentology of Arctic Fjords Experiment" (Geological Survey of Canada project 810042). Some 40 scientist from many different organizations participated in the project. The data they collected have been organized into 20 chapters and includes information on: synoptic oceanography, suspended particulate matter, benthos, boulder transport due to algae, geochemistry, geotechnical properties, grab and core samples, high resolution deep tow seismic profiles, sidescan sonar profiles, land surveys, instrument moorings, weather, heavy minerals and hydrography.

RÉSUMÉ

Syvitski, J.P.M. (Compiler) 1984. Sedimentology of Arctic Fjords Experiment: HU 83-028 and HU 82-031 data report, Volume 2. Can. Data Rep. Hydrogr. Ocean Sci. No. 28: 1130p.

Ce rapport est le second d'une série sur la sédimentologie des fjords arctiques (projet d'études géologiques n° 810042). Les données compilées sont présentées en 20 chapitres et 40 scientistes ont participé au projet. Les sujets traités sont les suivants: océanographie synoptique, particules en suspension, macrobenthos, microbenthos, transport de blocs par algues, échantillons de fonds marins, données sismiques a haute résolution (DTS), sonar latéral, études terrestres, mouillages d'instruments, données météorologiques, minéraux lourds et hydrographie.

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PREFACE

The enclosed 1097 page volume is the second data and technical report of the Sedimentology of Arctic Fjords Experiment (SAFE), or Geological Survey of Canada project 810042. SAFE is a comprehensive study on the climatology, hydrography, oceanography, sediment dynamics, stratigraphy and animal-sediment relationships in arctic fjords. The enclosed data is based on the first (HU-82-031) and second (HU-83-028) of three sister cruises to Baffin Island fjords. The 1983 cruise took place between Sept. 19 and October 3, during the narrow weather window of ice-melt and ice-freeze (for details see Report onC.S.S. Hudson Cruise 83-028, Baffin Is. Fjords, by K.W. Asprey and B.L. Johnston, GSC Open File Report 1004, 187 pp). This data report is made possible from the support of scientists from the universities of Colorado, Alberta, Queens, Memorial, Glasgow, East Anglia and Amsterdam; the U.S. National Ocean and Atmospheric Administration and the Canadian federal departments of Ocean Sciences and Surveys (DFO) and Energy Mines and Resources (GSC).

The results of Project SAFE have been of such high quality that previously established scientific models have been either shattered or finely tuned. Although fjords are unique environments, SAFE results provide needed background information to many of the global problems of land-sea interactions.

INTRODUCTION

The Geological Survey of Canada's project SAFE (Sedimentology of Arctic Fjords Experiment) was initiated in 1981 and is scheduled to be operational until 1987. The project is being carried out in a series of fjords that are situated along the east coast of Baffin Island. SAFE emphasizes the study of the Quaternary history and modern processes of arctic fjord environments. Its organizational framework co-ordinates the efforts of a multidisciplinary scientific team whose participants are interested in evaluating the significance of the comparatively rapid process rates, and of the high-resolution sedimentary records that typify these settings.

Arctic fjords have special characteristics because hinterland rivers usually have a short but intense discharge period, tidewater glaciers are common, and basin water stratification is adversely affected by both sea ice induced isohaline instabilities, and by wind mixing during the open-water season. The key objectives of SAFE reflect the interdisciplinary nature of fjord science. They include: 1. To understand sandur development and the character of the resultant facies. 2. To understand the time-dependant influences of rivers, tides, waves, wind and deep-water renewal on fjord circulation patterns. 3. To use the geological record of raised marine deposits in establishing late Quaternary history within and between fjords, and to further understand modern sedimentation patterns. Participating biologists, micropaleontologists, geotechnical engineers and geochemists are producing additional data on the interrelationship of modern processes and the geological record.

Following a 1982 reconnaissance of 10 fjords situated along the east coast of Baffin Island, three were selected for detailed study during the 1983 field season (Cambridge, Itirbilung, McBeth). Cambridge Fiord represents our 'Arctic' end member in terms of plankton and benthos. In addition the Cambridge system offers: (1) an active polynya; (2) low oxygen levels in the deep waters of the inner basin; (3) large submarine canyons; (4) two morphologically distinctive fjord-head deltas; (5) a moderately large, actively calving, tidewater glacier; (6) three sills; and (7) thick Quaternary sequences ponded between the sills.

Itirbilung Fiord has a classical sandur delta with a strong aeolian imprint. The prodelta is covered with chutes and channels that contain large scale sand-waves. Itirbilung is one of the most strongly influenced fjords in terms of side-entry fluvial and glacial inputs. The seismic stratigraphy reflects these inputs nicely.

Pangnirtung Fiord our third end-member was dropped (again as in 1982) because of the heavy ice conditions in Cumberland Sound. McBeth Fiord was selected as the practical alternative because of its large bay-head drainage area, and thick Quaternary infill.

The investigative strategy in each fjord included geophysical surveys of the fjord basins using the CSS HUDSON towed airgun, high resolution DTS Seismic and sidescan sonar. HUDSON station work consisted of bottom grabs, vertical plankton hauls, underwater photography, Lehigh and piston coring, and CTD/SPM profiling. During the day while Hudson carried out station work, two launches and two Boston whalers were used to conduct independent surveys. The CSL GREBE was used for bathymetric surveys, acoustic profiling, CTD profiling, grab sampling and sidescan sonar work. The CSL SHOVELLER was the principal hydrographic launch, but also carried out "Dart" unmanned submersible surveys and grab sampling. The Boston whalers were used mainly as landing craft, ferrying staff ashore to carry out land surveys of the deltas and side-entry systems. Grab sampling was conducted from the whalers from time to time.

Three weeks prior to the 1983 cruise, a helicopter survey team emplaced Aanderaa weather stations, sediment trap moorings and current meter - thermistor chain moorings near the main river deltas in Cambridge and Itirbilung fiords. The survey party also visited other deltas collecting samples, photographs and coastal surveys.

Weather stations, tide gauges and moorings were recovered on the last day that HUDSON was operating in Cambridge and Itirbilung fiords.

The HUDSON departed Thule Greenland 0800 on the 19th of September, 1983 bound for Baffin Island. HU 83-028 was completed 0900 October 5, 1983. HUDSON expedition accomplishments include 26 piston cores, 44 Lehigh cores, 63 CTD profiles, 53 SPM profiles, 187 SPM samples, 288 nutrients and dissolved oxygen samples), 432 bottom photographs, 10 vertical plankton hauls, 36 grab samples, and 400 km of geophysical lines. Launch accomplishments include 285 km of sounder and/or sidescan lines, 33 CTD profiles, 61 grabs, 4 ice samples, and 3 Dart profiles. The shore parties collected 181 sediment samples. Particulars concerning these samples are documented in the HU 83-028 expedition report (Asprey and Johnston, 1984, GSC open file 1004: 189 pp).

The success of the 1983 SAFE effort was related to the interdisciplinary character of the scientific team (aboard and ashore) and to the enthusiasm of technical and ship's support personnel. Drs. J. Syvitski (GSC), R. Gilbert (Queen's Univ.), F. Hein (Univ. Alberta) focussed their efforts on the sedimentological, geophysical, geotechnical, geochemical and mineralogical aspects of the program. Their collaborators include J. Mothersill (Rhoads Military College), R. Taylor (GSC), F. Longstaffe

(Univ. Alberta), G. Winters (GSC), R. Fitzgerald (GSC), M. Emory-Moore (Memorial Univ.), V. Horvath (Queen's Univ.), K. Asprey (GSC), M. Reasoner (Univ. Alberta). Technical support was provided by W. Leblanc (GSC),, M. Lamplugh (CHS), D. Silvester (HMCN), W. Catchpaugh (HMCN), G. Bika (HUNTEC), R. Currie (BIO), S. Hoskin (GSC), B. Kelly (GSC), A. Boyce (GSC), L. Johnston (GSC), D. Clattenburg (GSC), L. Warner (GSC), T. Atkinson (GSC), K. Robertson (GSC). Drs. C. Schafer (GSC), G. Farrow (Britoil) and their collaborators and technicians J. Atkinson (UMBS), G. Moore (UMBS), R. Belanger (BIO), F. Cole (GSC) and G. Gardner (Univ. Memorial) were responsible for the ecological aspects of the program. Drs. J. Andrews (INSTAAR) and G. Boulton (Univ. East-Anglia) investigated the onshore Quaternary geology and the offshore fjord stratigraphy. Their collaborators include J. van der Meer (Univ. Amsterdam), L. Osterman (INSTAAR), J. Kravitz (NOAA), A. Jennings (INSTAAR), K. Williams (INSTAAR), A. Geirsdöttir (INSTAAR), R. Kihl (INSTAAR). Physical Oceanographic studies were accomplished under the guidance of Drs. A. Hay (Memorial Univ.) and R. Trites (DFO) with technical support from J. Foley (Memorial Univ.) and L. Petrie (DFO). Other specialized research include the following participants: Drs. J.N. Smith (DFO), P. Mudie (GSC), A. Aksu (Dalhousie Univ.), and U. Weyer (NHRI).

This data report includes information from the 1982 Hudson cruise (for details see Syvitski, J.P.M. 1982 Cruise Report: C.S.S. HUDSON 82-031 GSC open file 897, 77 pp.; Syvitski, J.P.M. and Blakeney, C.P. 1983. Sedimentology of Arctic Fjords Experiment: HU 82-031 data report, volume 1. Canadian Data Report of Hydrog. Ocean Sci., No. 12, 935 pp.) together with the 1983 HUDSON cruise.

Project Leader J.P.M. Syvitski

Chief Scientist C.T. Schafer

TABLE 1:1

Station #	Yellow Sticker #	Approx. Waterdepth (m)	Lat.	Long.
CA0.2WS	8317555-63	125	71°11.50'	75°02.50'
CA1.0WS	8317537-45	164	71°11.80'	75°02.00'
CA1.1WS		200	71°12.70'	74°59.00'
CA1.2WS	8317546-54	201	71°12.60'	75°01.00'
CA2.0WS	8317582-90	329	71°16.40'	74°51.50'
CA2.2WS	8317573-81	285	71°19.40'	74°46.20'
CA3.0WS	8317564-72	375	71°23.50'	74°38.00'
CA4.1WS	8317528-35	515	71°27.50	74°45.00'
CA4.2WS	8317521-27	475	71°27.40'	74°49.50'
CA5.0WS	8317600-08	585	71°33.30'	74°44.50'
CA5.1W5	8317609-17	448	71°34.80'	74°37.00'
CA6.0WS	8317591-99	665	71°35.50'	74°38.40'
CA6.1WS	8317512-3,5-7	750	71°43.20'	74°36.50'
CA7.1WS	8317502-3,5-9	660	71°46.20'	74°24.50'
CA9.0WS	8317618-26	658	71°49.00'	73°32.00'
CA0.2GS	8318306	125	71°11.50'	75°02.50'
CA0.3GS	8318321	200	71°12.60'	75°02.00'
CA1.0GS	8318313	181	71°18.00'	75°02.00'
CA1.2GS	8318315	190	71°12.60'	75°01.00'
CA1.3GS	8318322	240	71°13.40'	74°59.00'
CA1.4GS	8318323	218	71°13.40'	74°57.00'
CA1.5GS	8318324	262	71°14.00'	74°57.00'
CA1.7GS	8318325	310	71°15.00'	74°54.00'
CA2.2GS	8318319	292	71°19.40'	74°46.20'
CA4.1GS	8318308	520	71°25.50'	74°45.70'
CA4.2GS	8318305	513	71°27.20'	74°48.40'
CA4.3GS	8318329	560	71°32.00'	74°50.50'
CA6.1GS	8318303	750	71°43.20'	74°36.50'
CA7.1GS	8318301	660	71°46.20'	74°24.50'
CASILL3-GS1	8318330	397	71°41.50'	74°25.00'
CASILL3-GS2	8318331	327	71°41.80'	74°24.00'
CASILL3-GS3	8318332	322	71°42.00'	74°24.00'
CASILL3-GS4	8318333	292	71°41.90'	74°24.00'
CASILL3-GS5	8318334	255	71°42.10'	74°23.60'
CA0.1LC	8318103	70	71°13.20'	74°56.00'
CA0.1PC	8318102	70	71°13.20'	74'56.00'
CA0.2LC	8318110	125	71°11.50'	75°02.50'
CA1.1LC	8318119	201	71°12.70'	74°59.00'
CA1.1PC	8318118	201	71°12.70'	74°59.00'
CA1.2LC	8318117	200	71°12.70'	75°01.00'
CA1.2PC	8318116	200	71°12.70'	75'01.00'

TABLE 1:1 (CONT'D)

Station #	Yellow Sticker #	Approx. Waterdepth (m)	Lat.	Long.
CA1.6LC	8318113-15	275	71°14.20'	74°57.00'
CA1.6PC	8318112	275	71°14.20'	74°57.00'
CA2.2LC	8318109	290	71°19.30'	74°46.00'
CA2.2PC	8318108	290	71°19.30'	74°46.00'
CA3.0PC	8318111	365	71°23.50'	74°38.00'
CA4.1LC	8318106-7	515	71°25.50'	74°45.70'
CA4.1PC	8318105	515	71°25.50'	74°45.70'
CA4.2LC	8318101	475	71°27.20'	74°48.40'
CA4.2PC	8318104	365	71°25.50'	74°50.00'
CA5.1PC	8318125	439	71°34.80	74°37.00'
CA6.0LC	8318120-21	665	71°35.50'	74°38.40'
MC0.1WS		98	69°31.90'	70°00.00'
MC0.1WS-A	8317726-34	98	69°31.90'	70°00.00'
MC0.1WS-B		151	69°31.00'	69°57.00'
MC0.1WS-C	8317744-52	175	69°31.00'	69°57.00'
MC0.1WS-D		135	69°31.00'	69°57.00'
MC0.2WS		?	69°32.50'	69°49.50'
MC0.2WS-B		?	69°32.40'	69°50.00'
MC1.0WS-B		?	69°31.00'	69°57.00'
MC1.2WS		?	69°32.40'	69°50.10'
MC2.0WS		?	69°33.50'	60°38.20'
MC2.0WS-B	8317735-43	320	69°33.50'	69°40.20'
MC2.0WS-C		?	69°33.50'	69°40.20'
MC2.1WS		?	69°32.10'	69°27.30'
MC2.1WS-B	8317753-61	320	69°32.20'	69°27.30'
MC2.1WS-C		?	69°32.20'	69°27.30'
MC2.2WS		?	69°31.40'	69°21.00'
MC3.05WS	8317771-79	540	69°33.50'	69°01.00'
MC3.0WS		?	69°31.30'	69°15.50'
MC3.0WS-B		?	69°31.30'	69°15.50'
MC3.1WS		?	69°34.40'	68°58.50'
MC3.1WS-B		?	69°34.40'	68°58.50'
MC4.1-B		?	69°36.60'	68°44.50'
MC4.1WS-B		?	69°36.60'	68°44.50'
MC4.1WS-C	8317762-70	549	69°36.60'	68°44.50'
MC5.0WS		?	69°36.50'	68°37.40'
MC5.0WS-B		?	69°36.50'	68°34.90'
MC5.1WS		?	69°34.30'	68°21.40'
MC0.1GS	8318370	152	69°31.00'	69°57.00'
MC2.0GS	8318366	320	69°33.50'	69°40.20'
MC2.1GS	8318363	320	60°32.10'	69°27.30'
MC4.1GS	8318374	549	69°36.60'	68°44.50'
MC83.6GS	8318375	439	69°40.70'	68°09.80'

TABLE 1:1 (CONT'D)

Station #	Yellow Sticker #	Approx. Waterdepth (m)	Lat.	Long.
MC0.1LC-4	8318175	152	69°31.00'	69°57.00'
MC0.1LC-5	8318176	150	69°31.00'	69°57.00'
MC2.0LC	8318169-70	320	69°33.50'	69°40.20'
MC2.0PC	8318168	320	69°33.50'	69°40.20'
MC2.1LC	8318165,67	320	69°32.10'	69°27.30'
MC2.1PC	8318164	320	69°32.10'	69°27.30'
MC2.2LC	8318178	410	69°31.40'	69°21.00'
MC2.2PC	8318177	410	69°31.40'	69°21.00'
MC4.1LC	8318180-81	549	69°36.60'	68°44.50'
MC4.1PC	8318179	549	69°36.60'	68°44.50'
MC83.6PC	8318376	429	69°40.70'	68°09.80'
IT0.1LC	8318128-29	73	65°16.20'	69°14.40'
IT0.1PC	8318127	73	65°16.20'	69°14.40'
IT0.2PC	8310141	88	69°16.40'	69°15.00'
IT0.3LC	8318131-32	155	65°16.20'	69°14.40'
IT0.3PC	8318130	155	65°17.50'	69°11.00'
IT0.4LC	8318134-35	155	69°17.90'	69°12.10'
IT0.4PC	8318133	155	69°17.90'	69°12.10'
IT1.1LC	8318139-40	256	69°20.00'	69°03.80'
IT1.1PC	8318138	256	69°20.00'	69°03.80'
IT1.2LC	8318137	293	69°20.80'	69°01.50'
IT1.2PC	8318136	293	69°20.80'	69°01.50'
IT2.1PC	8318156	325	69°20.30'	68°51.20'
IT2.2LC	8318154-55	402	69°19.30'	68°45.50'
IT2.2PC	8318153	400	69°19.30'	68°45.50'
IT2.3LC	8318159-60	424	69°17.50'	68°27.00'
IT2.3PC	8318158	424	69°17.50'	68°27.00'
IT3.1PC	8318362	365	69°17.60'	68°12.30'
IT0.1WS	8317672-78	55	69°16.30'	69°15.10'
IT0.1WS-B		82	69°16.40'	69°15.10'
IT0.1WS-C		88	69°16.40'	69°15.10'
IT0.1WS-D		73	69°16.40'	69°15.10'
IT0.2WS	8317654-61	91	69°16.40'	69°15.00'
IT0.3WS	8317663-71	155	69°17.50'	69°11.00'
IT0.4WS		148	69°17.90'	69°12.10'
IT1.1WS	8317645-52	257	69°20.00'	69°03.80'
IT1.2WS-A	8317636-44	302	69°20.80'	69°01.50'
IT1.2WS-B	8317681-89	283	69°01.50'	69°20.70'
2T2.1WS	8317699-707	348	69°20.30'	68°51.20'

TABLE 1:1 (CONT'D)

Station #	Yellow Sticker #	Approx. Waterdepth (m)	Lat.	Long.
IT2.2WS	8317690-98	402	69°19.30'	69°45.50'
IT2.3WS	8317708-16	410	69°17.50'	68°28.00'
IT3.0WS		425	69°17.00'	68°22.00'
IT3.1WS	8317717-25	356	69°17.60'	68°12.30'
IT5.0WS		310	69°04.20'	67°10.00'
IT6.0WS	8317627-35	585	68°52.70'	68°24.50'
IT0.1GS	8318349	55	69°16.40'	69°15.10'
IT0.2GS	8318341	88	69°16.14'	69°15.00'
IT0.3GS	8318343	155	69°17.50'	69°11.00'
IT0.4GS	8318345	148	69°17.90'	69°12.10'
IT1.1GS	8318339	256	69°20.00'	69°03.80'
IT1.2GS	8318352	293	69°01.50'	69°20.70'
IT2.1GS	8318354	310	69°25.30'	68°51.20'
IT2.2GS	8318353	402	69°19.30'	68°45.50'
IT2.3GS	8318360	424	69°17.50'	68°27.00'
IT3.1GS	8318363	356	69°17.60'	68°12.30'
IT5.GS	8318364	175	69°04.20'	67°10.00'
IT6.GS	8318336	502	68°52.70'	66°24.50'
IT6.GS-B	8318365	355	68°57.50'	66°43.00'

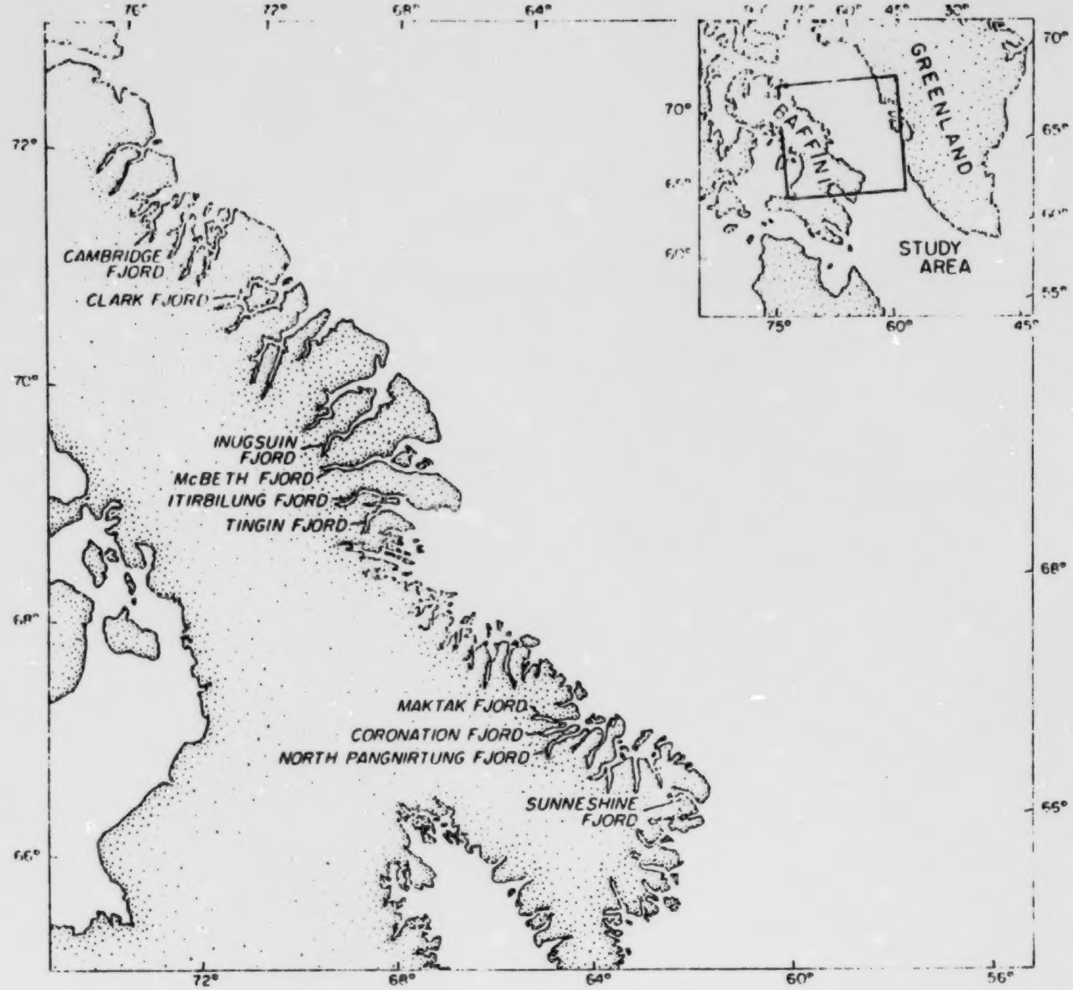
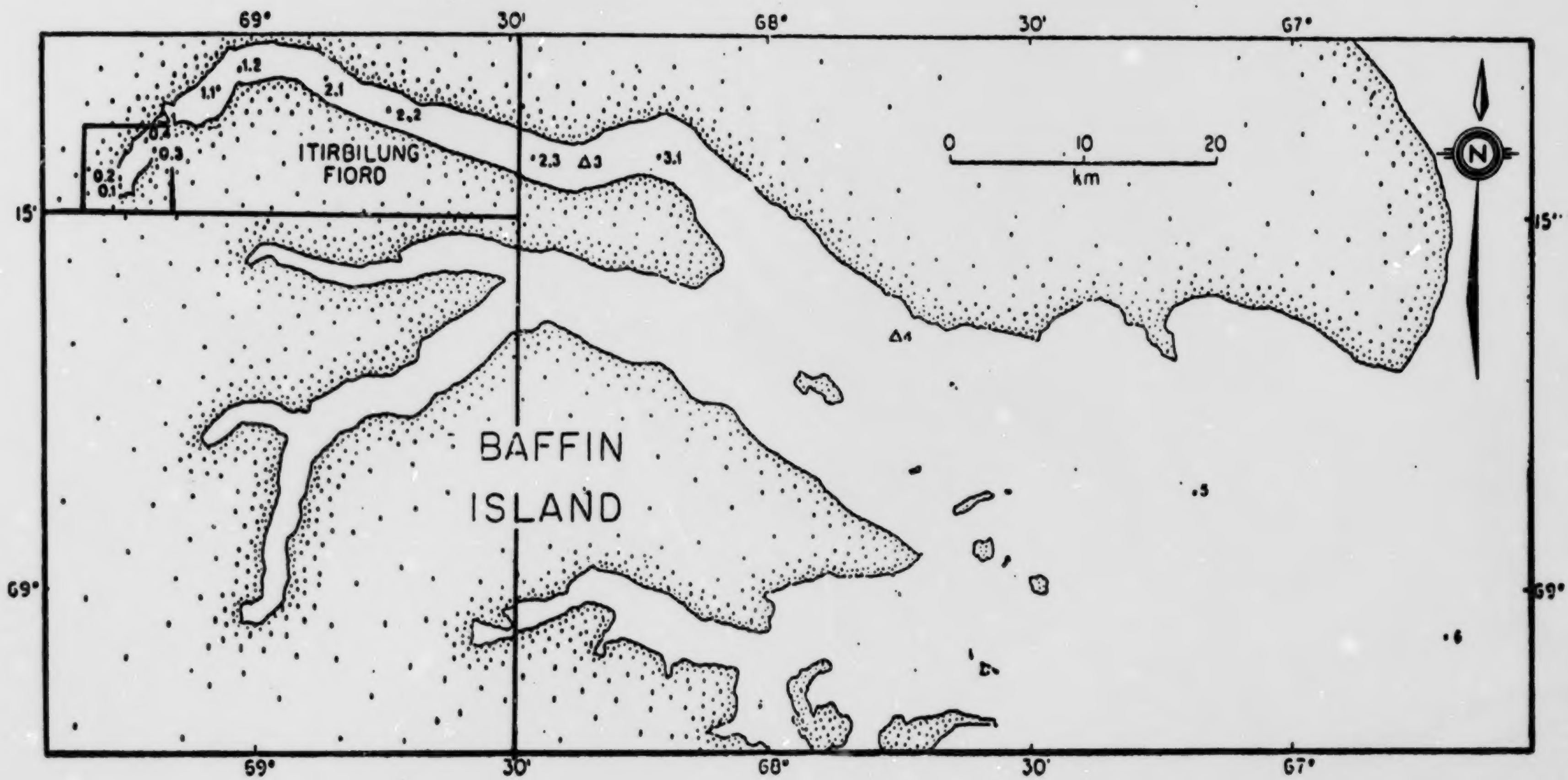

CAMBRIDGE FJORD
CLARK FJORD
INUGSUIN FJORD
McBETH FJORD
ITIRBILUNG FJORD
TINGIN FJORD
MAKTAK FJORD
CORONATION FJORD
NORTH PANGNIRTUNG FJORD
SUNNESHINE FJORD
BAFFIN
GREENLAND
STUDY AREA
76°
72°
68°
64°
60°
56°
70°
66°
65°
75°
45°
30°
55°

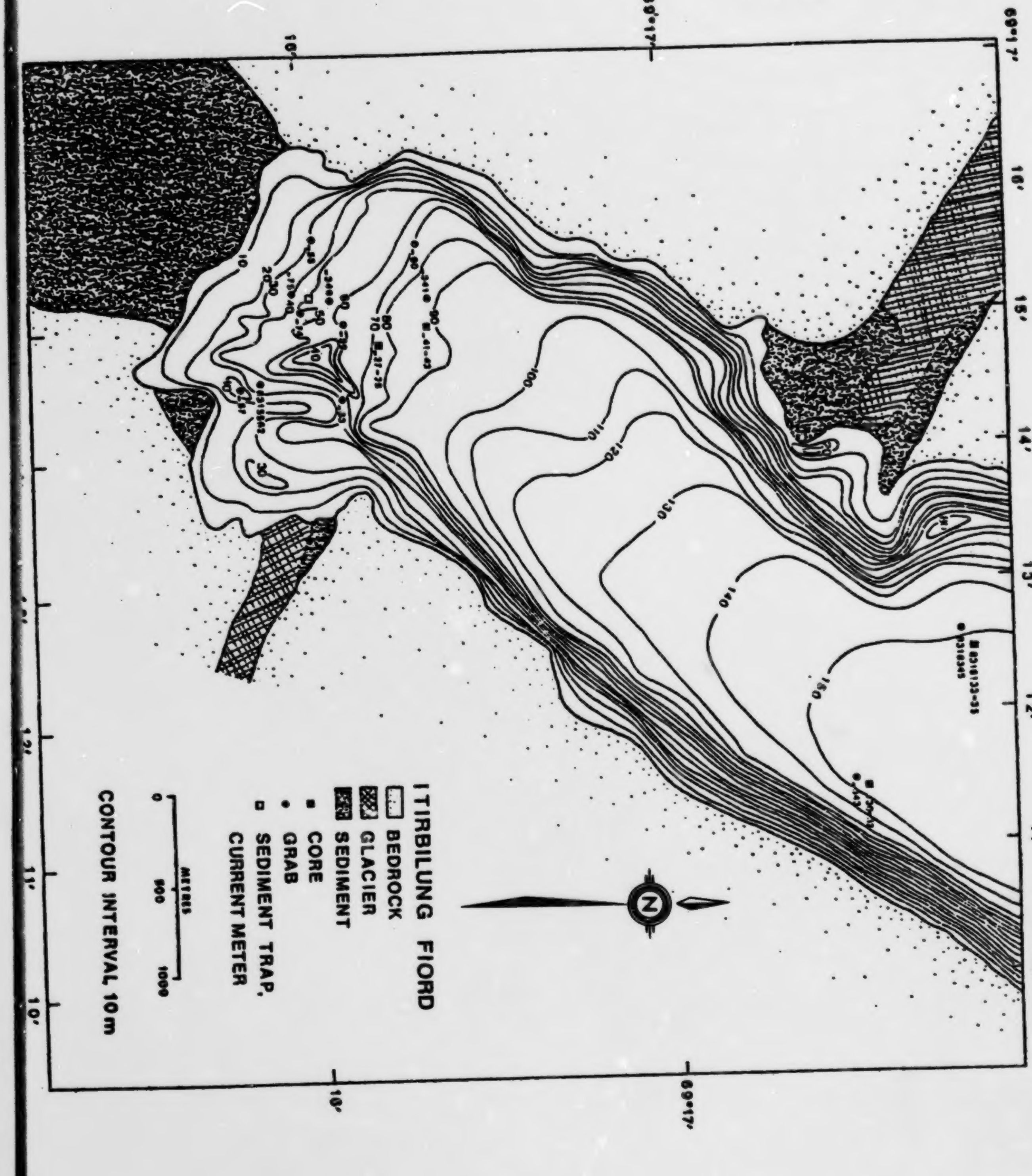
Figure 1.1



△ ·82031

83028

Figure 1.2


ITIRBILUNG FIORD
BEDROCK
GLACIER
SEDIMENT
CORE
GRAB
SEDIMENT TRAP, CURRENT METER
METERS
0
500
1000
CONTOUR INTERVAL 10m
69°17'
10'
16'
15'
14'
13'
12'
11'
10'
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

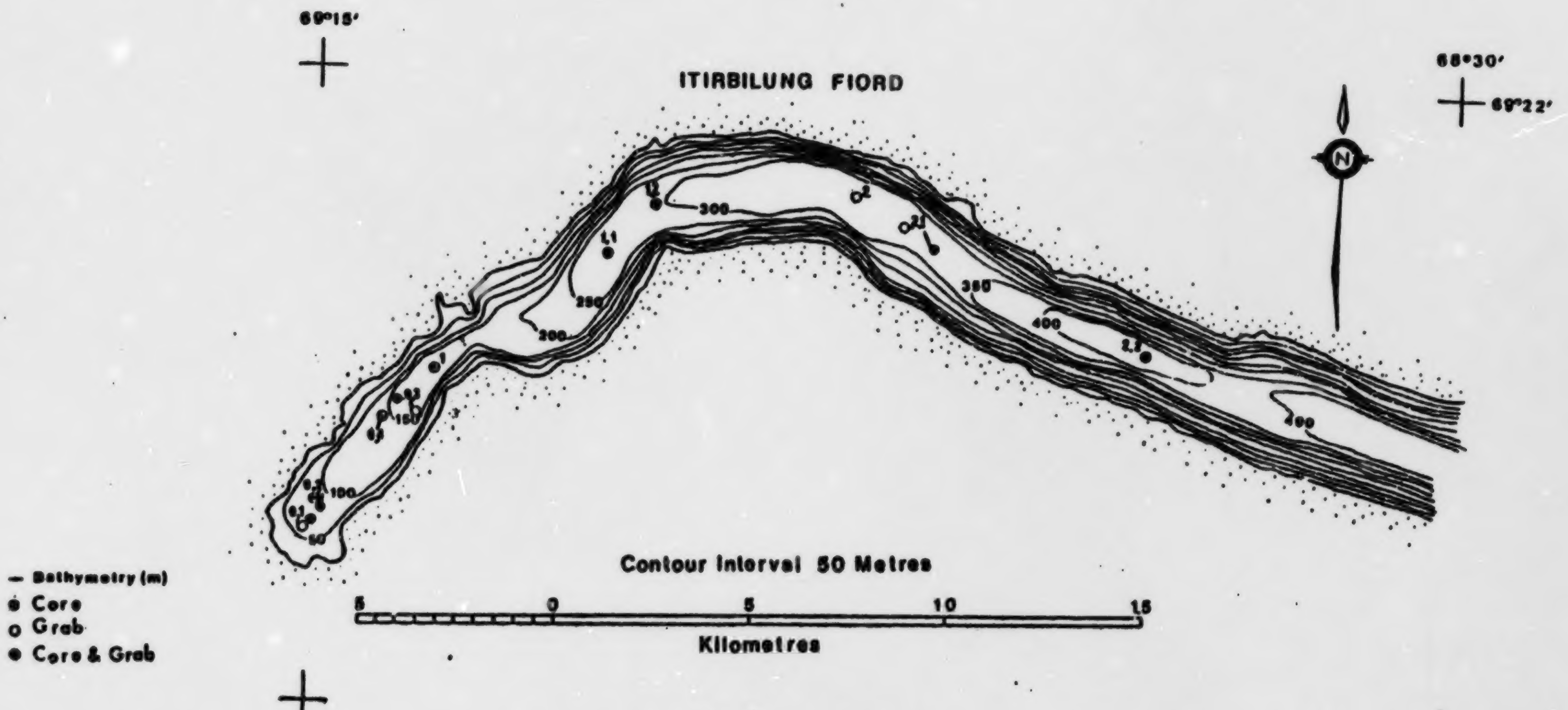

69°15'
68°30'
69°22'
69°14'
ITIRBILUNG FIORD
N
50
100
150
200
250
300
350
400
400
Contour Interval 50 Metres
5
0
5
10
15
Kilometres
— Bathymetry (m)
◐ Core
○ Grab
● Core & Grab

Figure 1.4

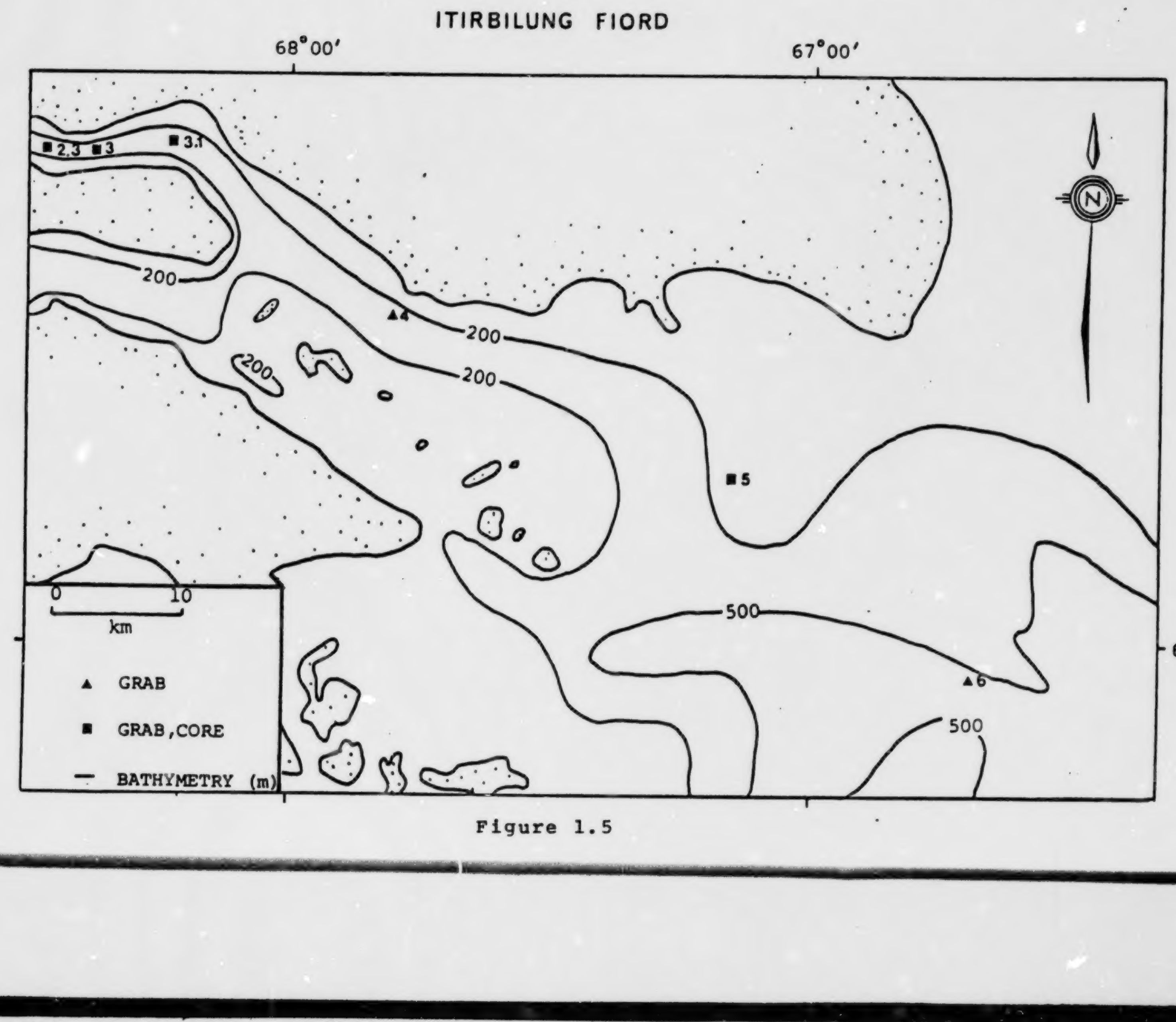

ITIRBILUNG FIORD
68°00′
67°00′
69°00′
2,3
3
3.1
200
200
200
200
4
5
500
500
6
N
0
10
km
▲ GRAB
■ GRAB, CORE
— BATHYMETRY (m)

Figure 1.5

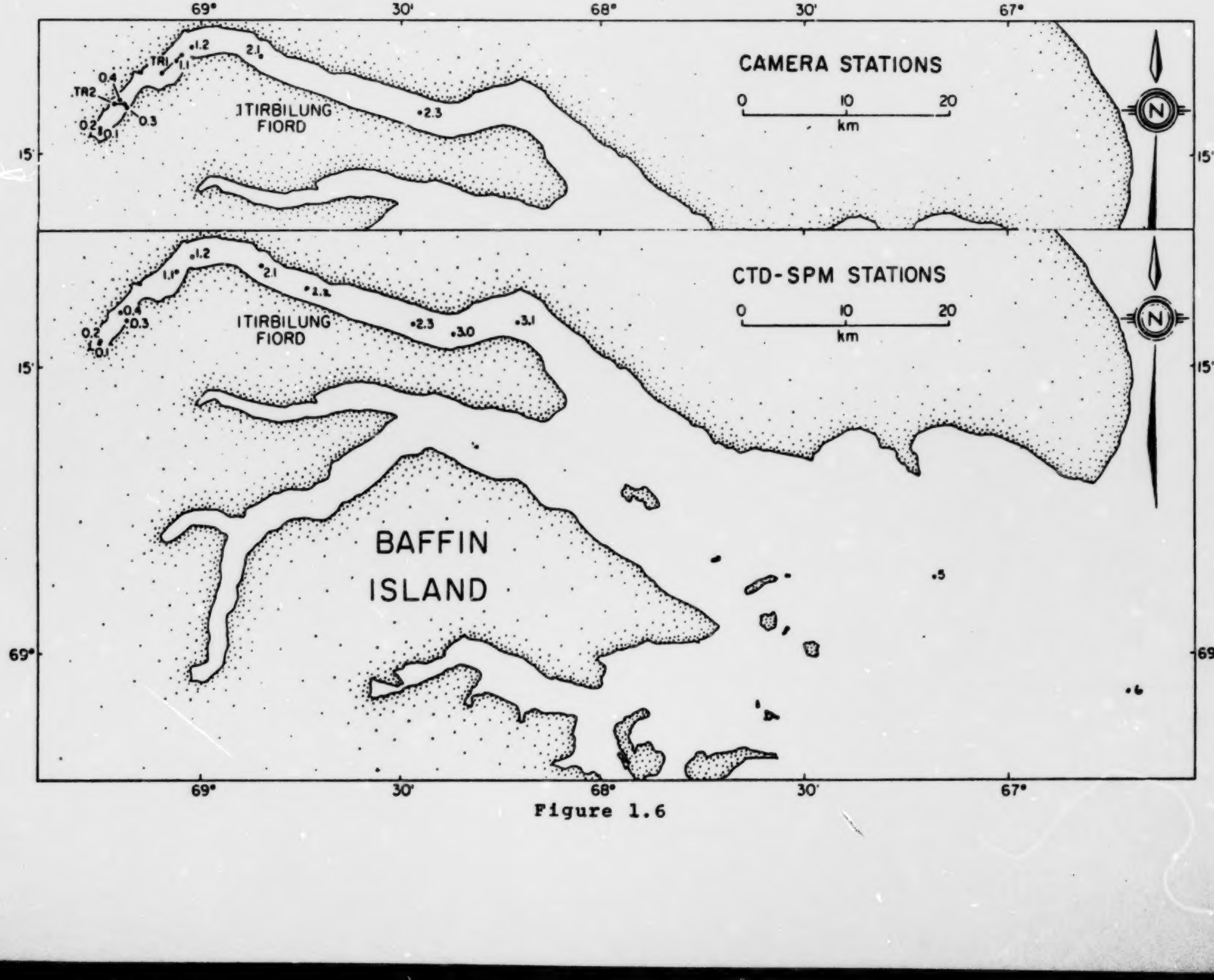

CAMERA STATIONS
0
10
20
km
ITIRBILUNG FIORD
TR2
0.4
TR1
1.2
1.1
2.1
0.2
0.1
0.3
2.3
CTD-SPM STATIONS
1.1
2.1
2.2
0.4
2.3
3.0
3.1
BAFFIN ISLAND
5
6
69°
30'
68°
30'
67°
15'
69°

Figure 1.6

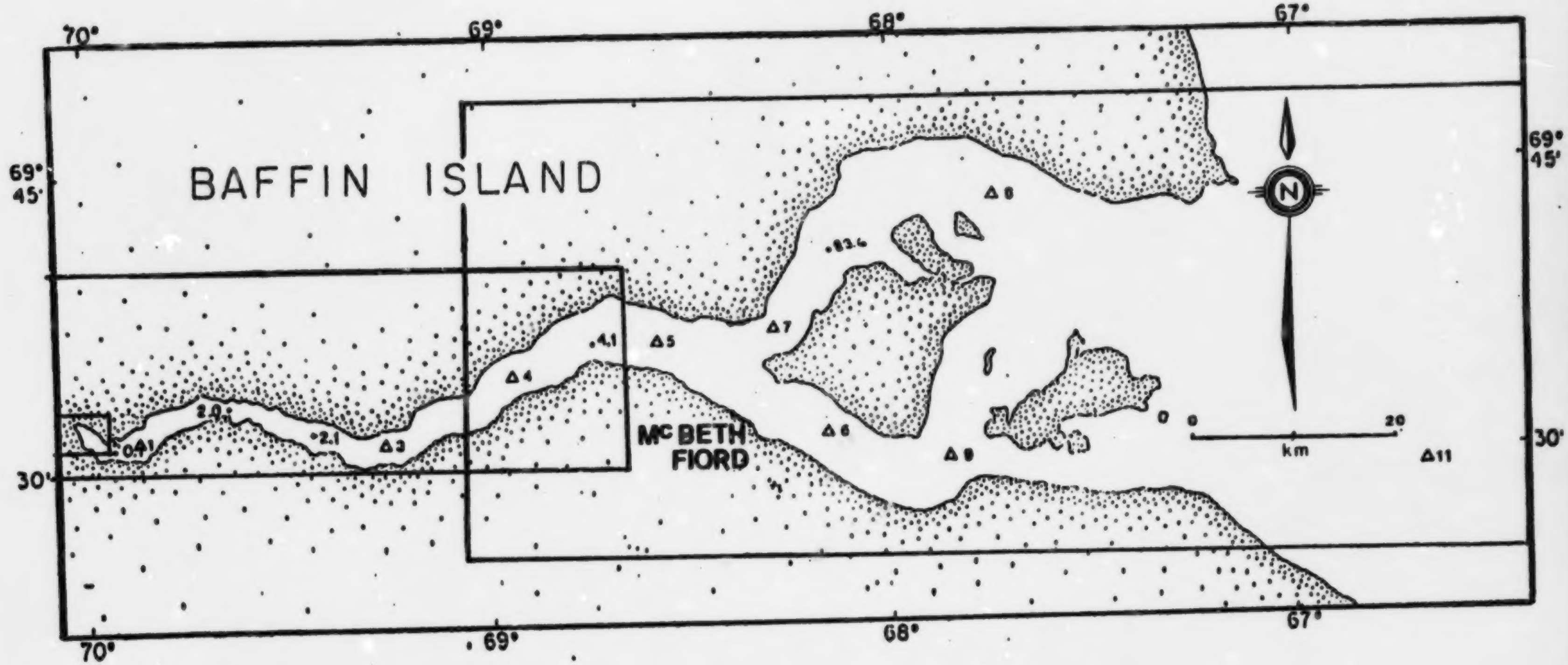

BAFFIN ISLAND
Mc BETH FIORD
70°
69°
68°
67°
69° 45'
30'
N
0
20
km
0.41
2.0
2.1
Δ3
Δ4
4.1
Δ5
Δ6
Δ7
83.4
Δ8
Δ9
Δ11
Δ 82031
• 83028

Figure 1.7

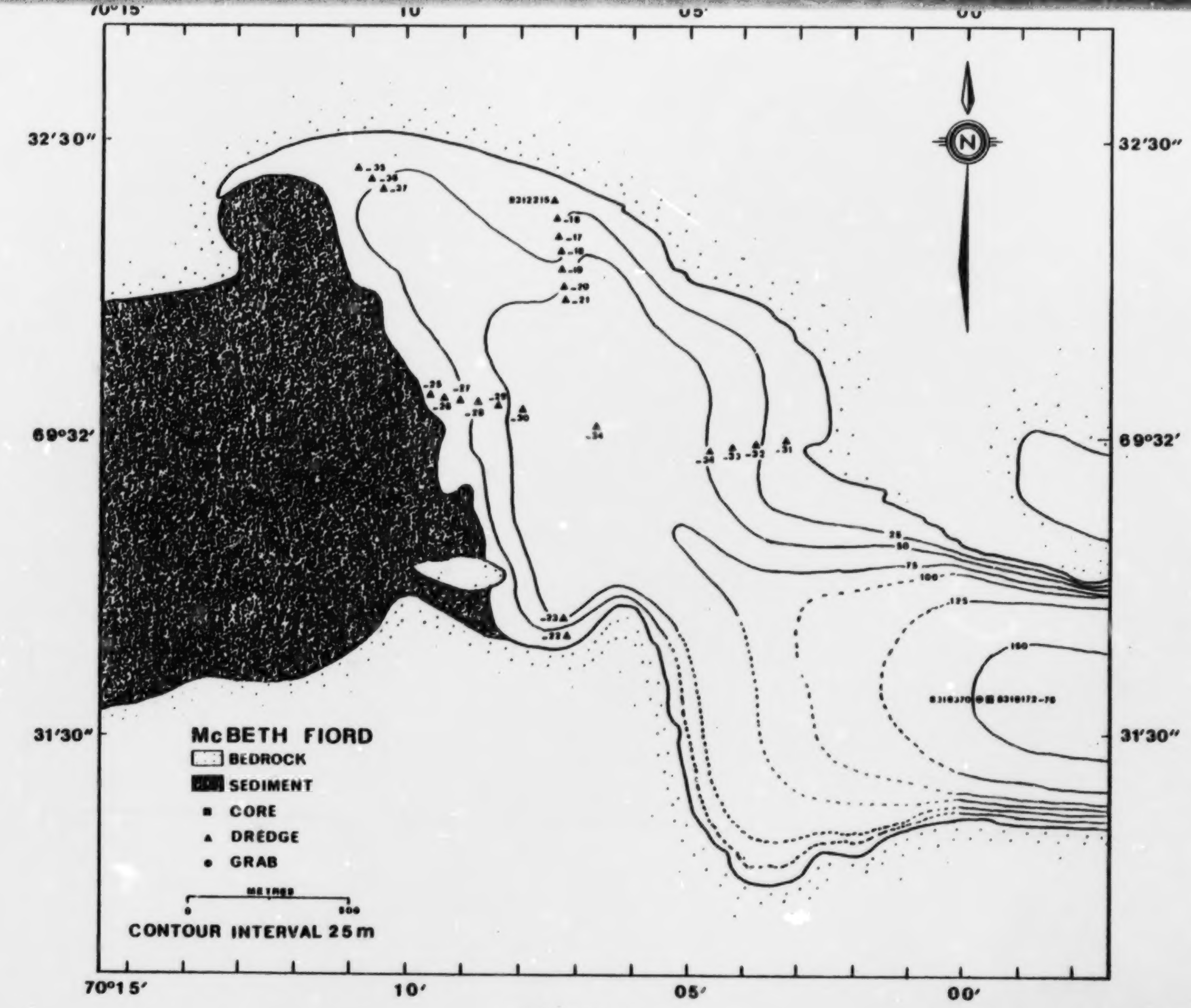

70°15′
10′
05′
00′
32′30″
69°32′
31′30″
McBETH FIORD
BEDROCK
SEDIMENT
CORE
DREDGE
GRAB
METRES
0
500
CONTOUR INTERVAL 25m
25
50
75
100
125
150

Figure 1.8

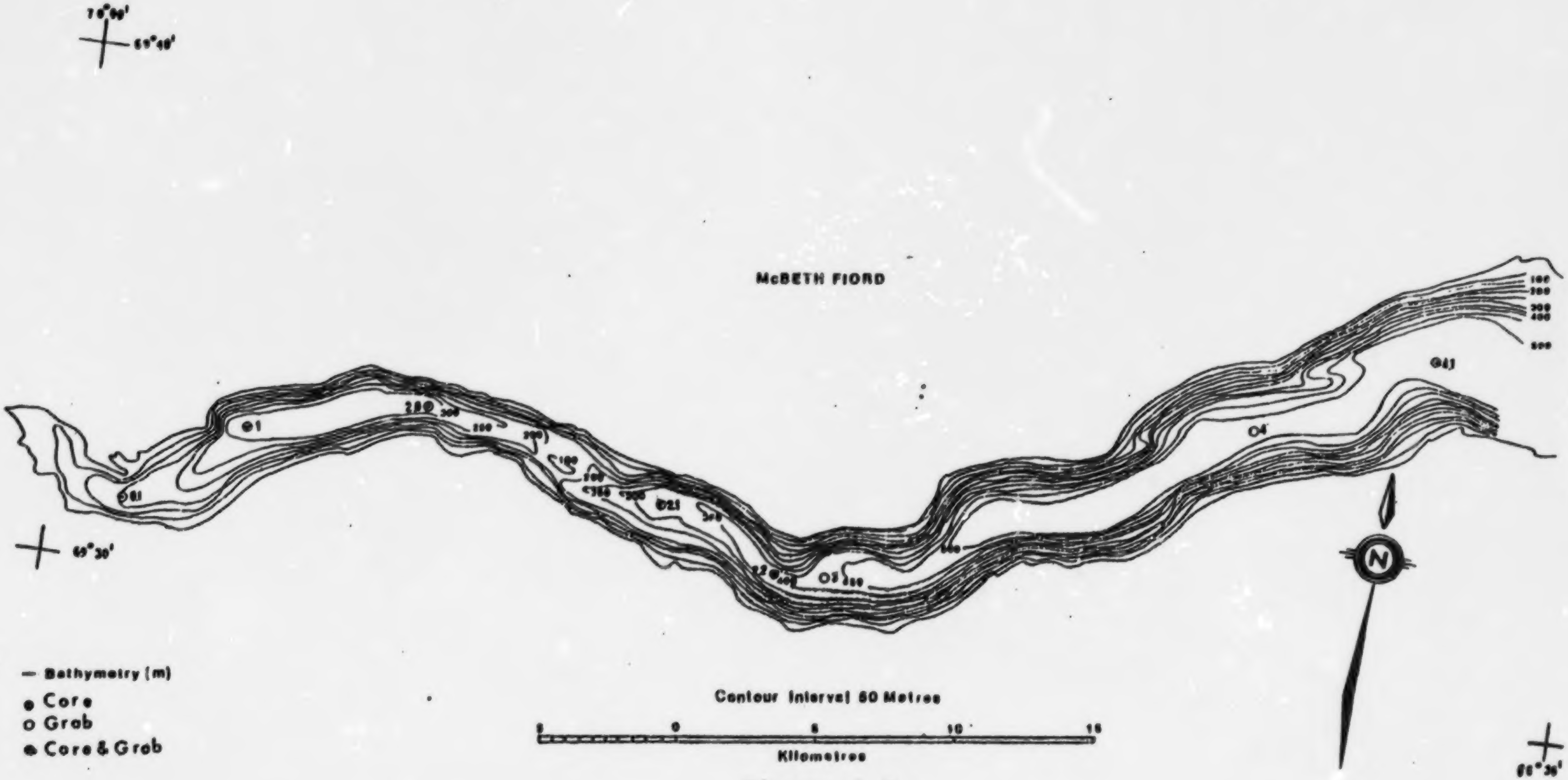

70°00'
69°40'
McBETH FIORD
1
28
300
200
200
100
200
<300
200
21
300
12
400
3
300
500
4
41
100
200
300
400
500
69°30'
68°30'
N
— Bathymetry (m)
● Core
○ Grab
◉ Core & Grab
Contour Interval 50 Metres
5
0
5
10
15
Kilometres

Figure 1.9

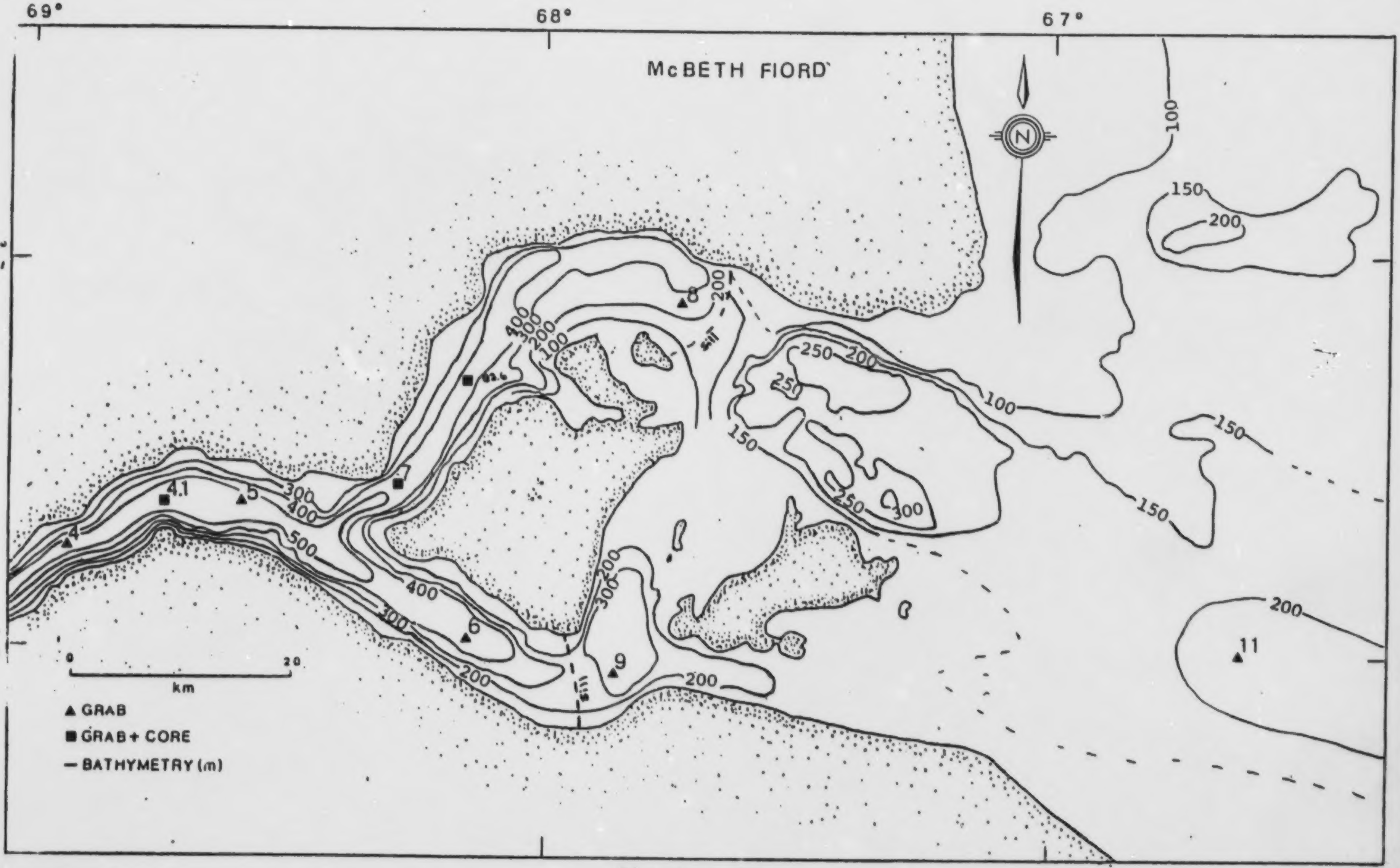

69°
68°
67°
69°
45'
69°
30'
McBETH FIORD
N
4
4.1
5
6
8
9
11
62.6
sill
sill
500
400
300
200
100
250
150
0
20
km
▲ GRAB
■ GRAB + CORE
— BATHYMETRY (m)

Figure 1.10

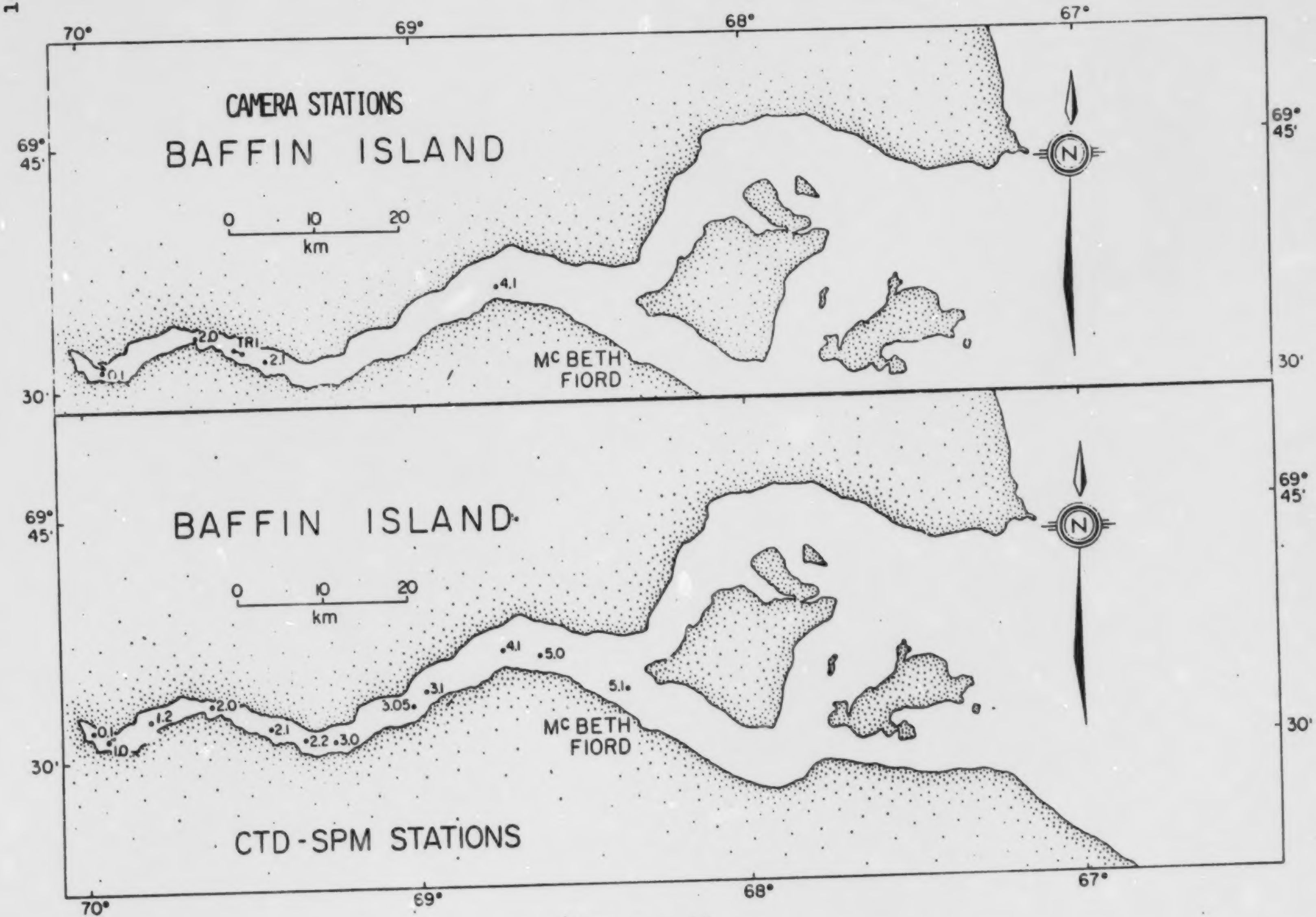

CAMERA STATIONS
BAFFIN ISLAND
0
10
20
km
.0.1
.2.0
TRI
.2.1
.4.1
Mc BETH FIORD
70°
69°
68°
67°
69° 45'
30'
N
BAFFIN ISLAND
.0.1
.1.0
.1.2
.2.0
.2.1
.2.2
.3.0
3.05.
.3.1
.4.1
.5.0
5.1.
Mc BETH FIORD
CTD-SPM STATIONS

Figure 1.11

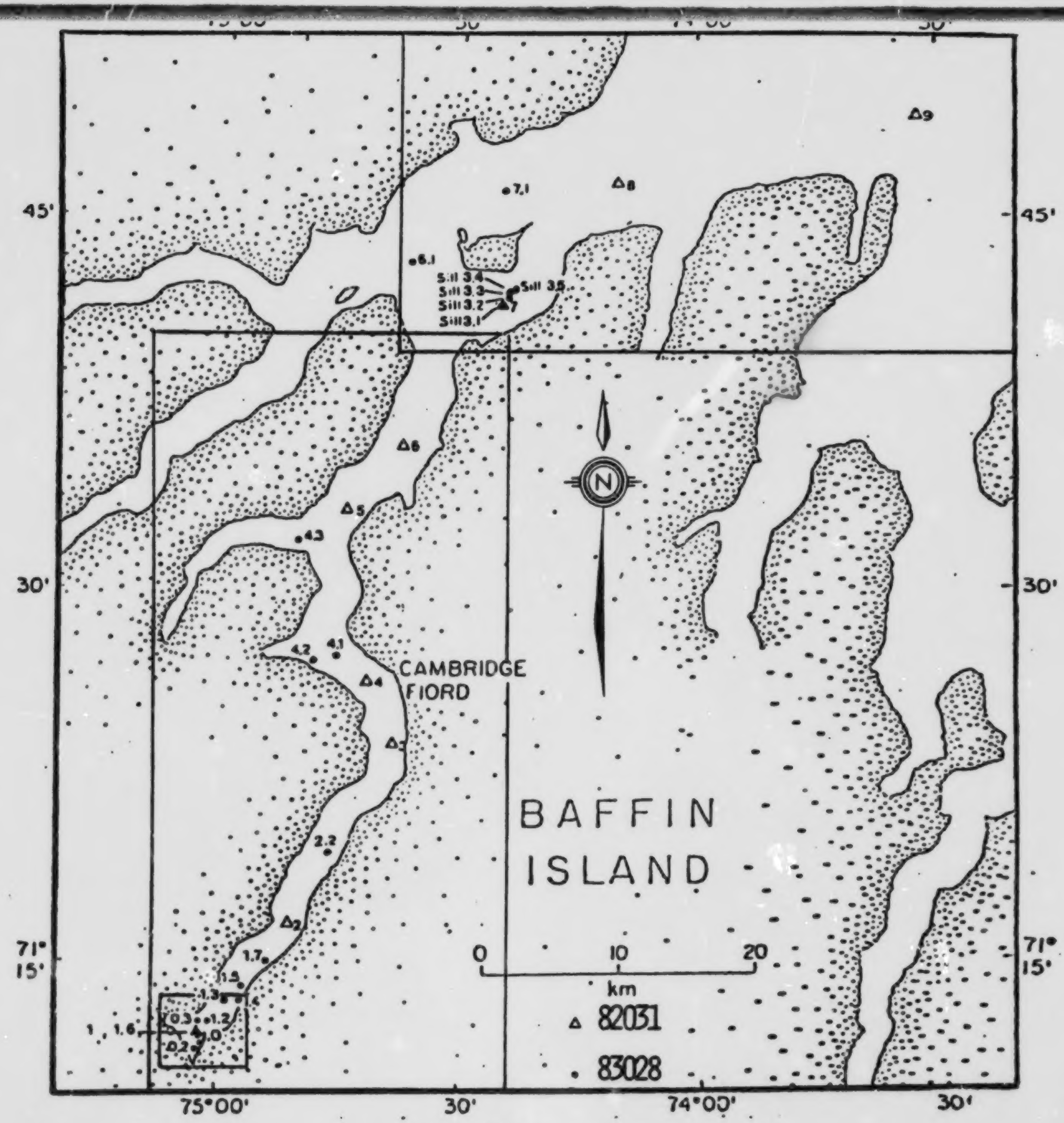

Δ9
•7.1
Δ8
45'
45'
•6.1
Sill 3.4
Sill 3.3
Sill 3.2
Sill 3.1
Sill 3.5
Δ6
Δ5
•4.3
30'
30'
4.2
4.1
Δ4
CAMBRIDGE
FIORD
Δ3
BAFFIN
ISLAND
2.2
Δ2
71°
15'
71°
15'
1.7
1.5
1.3
1.4
0.3
1.2
1
1.6
1.0
0.2
0
10
20
km
Δ 82031
• 83028
75°00'
30'
74°00'
30'

Figure 1.12

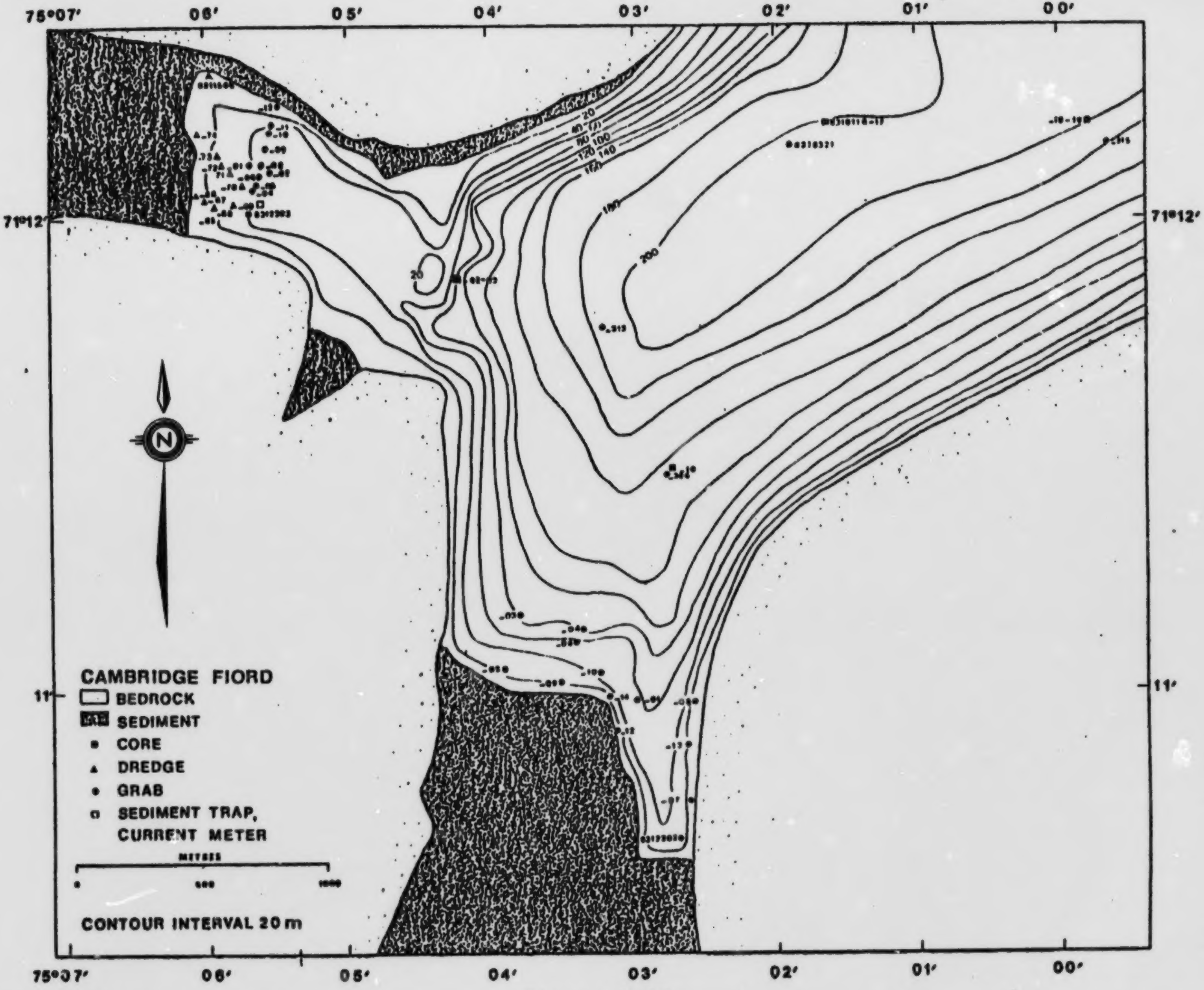

75°07'
06'
05'
04'
03'
02'
01'
00'
71°12'
11'
20
40
60
80
100
120
140
160
180
200
CAMBRIDGE FIORD
BEDROCK
SEDIMENT
■ CORE
▲ DREDGE
● GRAB
□ SEDIMENT TRAP, CURRENT METER
METRES
0
500
1000
CONTOUR INTERVAL 20 m
N

Figure 1.13

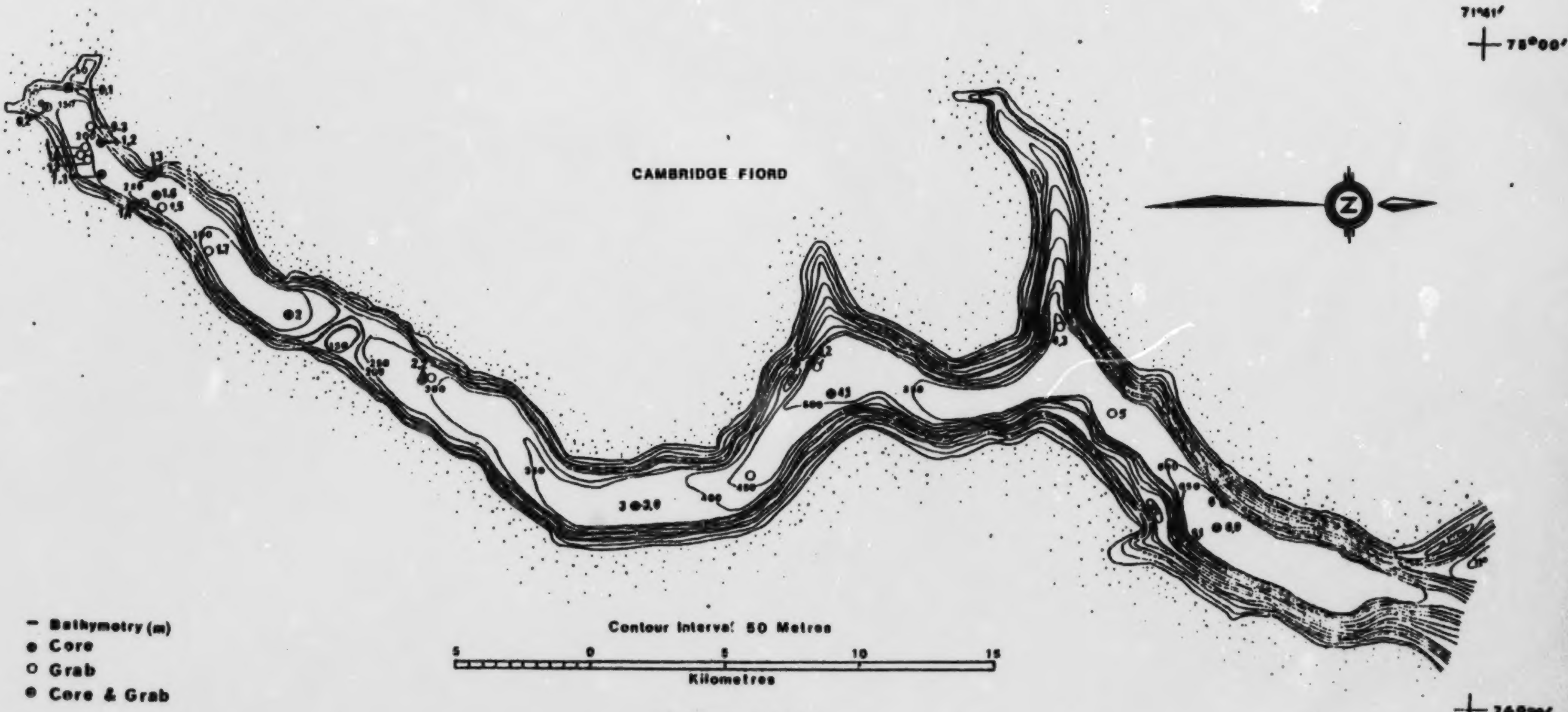

CAMBRIDGE FIORD
71°51'
75°00'
74°30'
Z
— Bathymetry (m)
● Core
○ Grab
● Core & Grab
Contour Interval 50 Metres
5
0
5
10
15
Kilometres
3.0
4.5
5
6.9
8.3
2
1.6
1.5
1.7

Figure 1.14

CAMBRIDGE FIORD

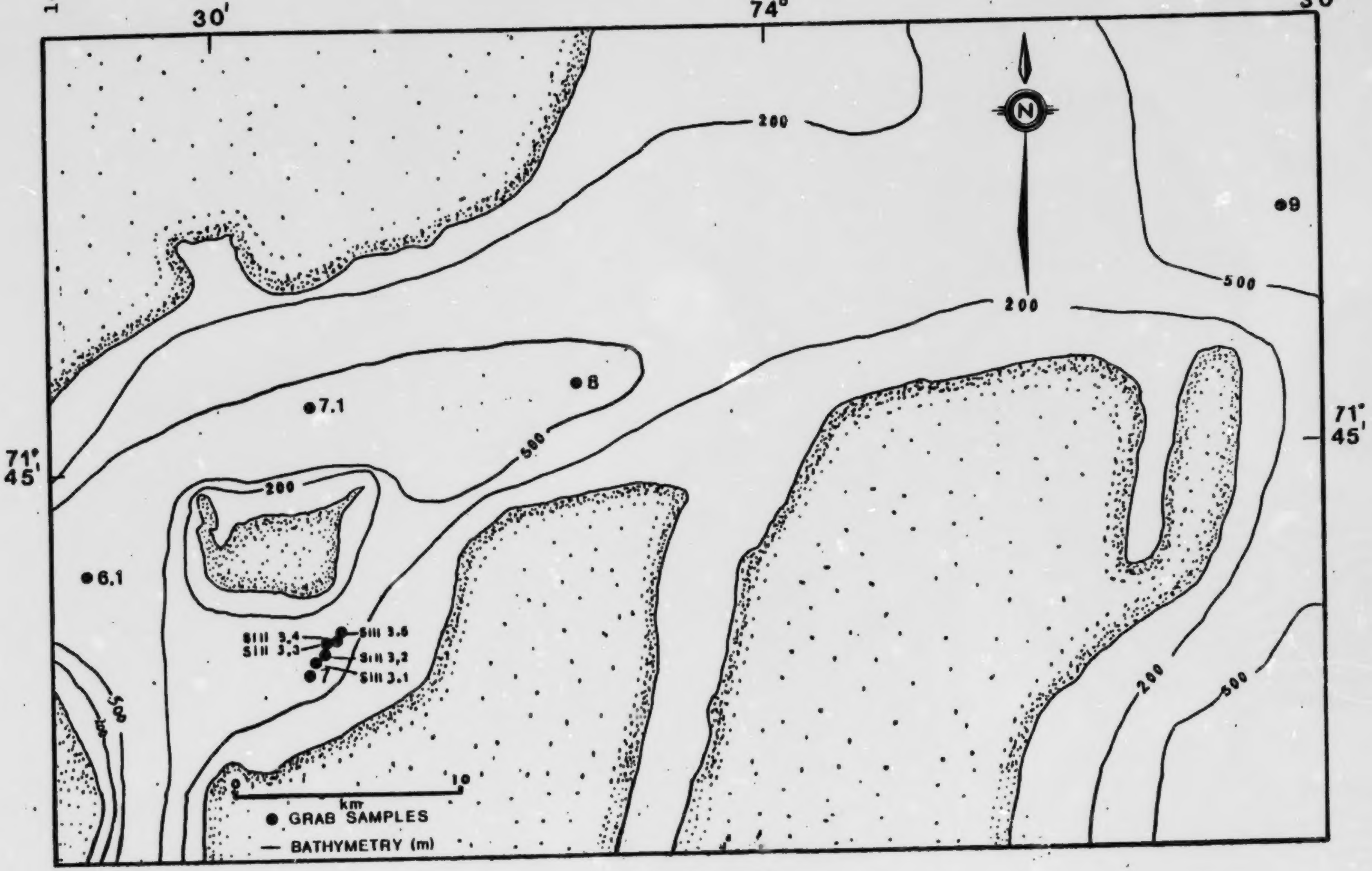


Figure 1.15

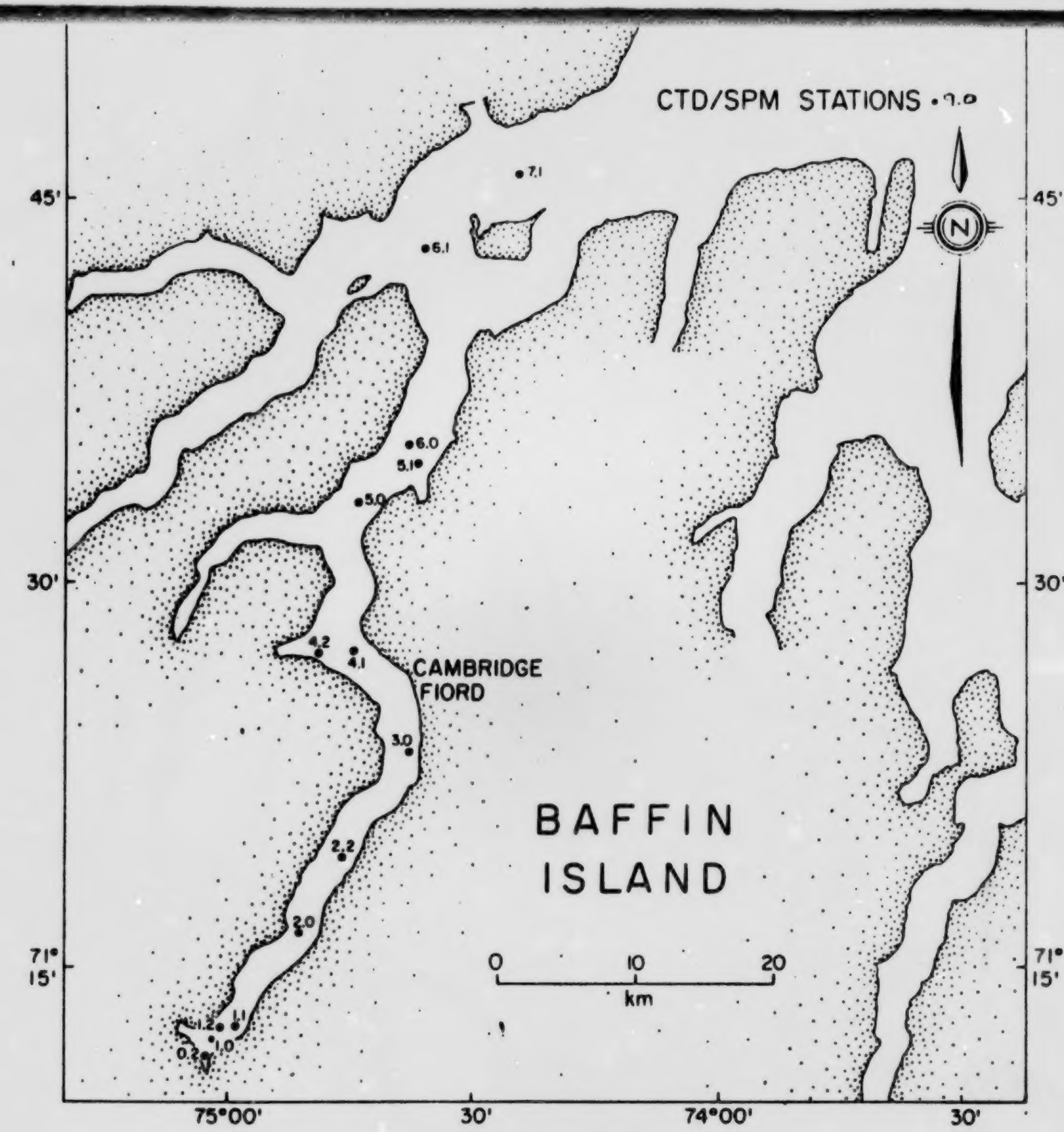
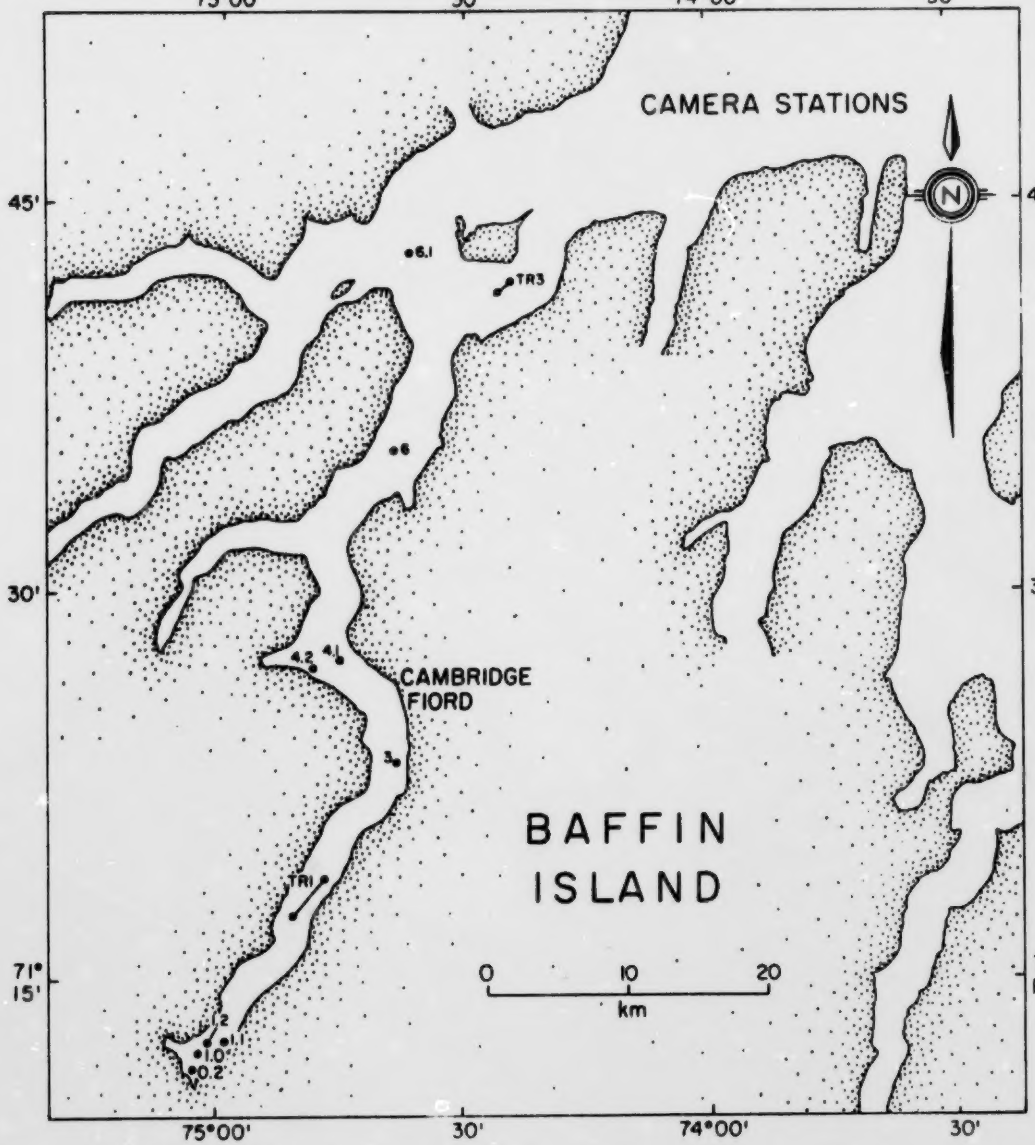

CTD/SPM STATIONS • 7.0
7.1
6.1
6.0
5.1
5.0
4.2
4.1
3.0
2.2
2.0
1.2
1.1
1.0
0.2
CAMBRIDGE FIORD
BAFFIN ISLAND
N
0
10
20
km
45'
30'
71°
15'
75°00'
30'
74°00'
30'

Figure 1.16


CAMERA STATIONS
N
CAMBRIDGE FIORD
BAFFIN ISLAND
6.1
TR3
6
4.2
4.1
3
TR1
1.2
1.1
1.0
0.2
0
10
20
km
75°00'
30'
74°00'
30'
45'
30'
71° 15'

SECTION 2

SYNOPTIC OCEANOGRAPHY

Baffin Island Fjords, Cruise 83-028

by

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Marine Ecology Laboratory

Bedford Institute of Oceanography

PO Box 1006

Dartmouth, Nova Scotia

B2Y 4A2

INTRODUCTION

The principal objective of the synoptic oceanography program was to further improve upon the general description of the physical oceanographic properties of three of the fjords visited in 1982 (Cambridge, McBeth and Iterbilung). As in BIO cruise 82-031 Syvitski and Blakeney, 1983) the data, for the most part, is composed of measurements of temperature, salinity, density, dissolved oxygen, nutrients and light transmission at a series of stations extending from near the head of each fjord to a point seaward of its mouth. While the bulk of the data was taken directly from the CSS HUDSON, measurements were also taken from the Scientific Launch (Grebe) which operated near the head of the fjords.

Generally, each station was occupied only once during the cruise. However, for the inner half of McBeth fjord, two CTD sections, separated in time by two days, provided data useful in examining some aspects of short period variability.

SAMPLING AND ANALYTICAL METHODS

a. Temperature, Salinity and Light Transmission

The temperature and salinity measurements aboard CSS HUDSON were taken using a continuous profiling digital Guildline CTD (Model 8705) and recorded on 9-track magnetic tape. A portable continuous profiling Guildline CTD (Model 8770) was used aboard the scientific Launch. Data were recorded on cassette tape. Salinities are reported as parts per thousand (ppt).

Potential densities were calculated from the temperature and salinity measurements using the UNESCO 1980 formulation and are expressed in sigma- units. Optical properties were measured with an Oregon-red light meter and are reported as percent light transmission.

On the CSS HUDSON a rosette sampler was coupled with the CTD and light meter. The unit was fitted with 9, 5-litre Niskin bottles. At nearly all stations samples were taken at 9 depths during the up-cast. Salinity samples were drawn from all casts, and returned to BIO for subsequent analyses in the laboratory using a Guildline Autosal Model 8400 salinometer. These laboratory determined salinities were used to adjust the salinities measured by the Guildline profiling unit. "In situ" temperatures were measured at selected sampling depths using reversing thermometers as a check on the temperature calibration of the Guildline CTD.

b. Dissolved Oxygen and Nutrients

Samples were drawn from all Niskin bottles and dissolved oxygen determined using a modification of the classical Winkler procedure (Levy, et al., 1977) and are reported in millilitres per litre (ml/l).

Samples for nutrient analyses (phosphate, nitrate and silicate) were taken in triplicate, and frozen quickly in small polyethylene vials (approx. 5 ml) and stored in a deep freeze at approximately -20°C. Samples were analyzed several months later at BIO using standard methods (Strickland and Parsons, 1968) with an Auto Analyser II. In reporting nutrient concentrations the values of the three samples were averaged in most cases. In instances where one of the three values was appreciably different from the other two, it was discarded from the average. Values are reported in g-at/ .

RESULTS

After editing the magnetic tapes and applying any corrections, a vertical profile of temperature, salinity, density, light transmission and a T-S diagram were plotted for each CTD and light meter station taken from CSS HUDSON)Pages 2-32 to 2-104) and for each CTD station taken from the Scientific Launch (pages 2-105 to 2-133). Only the down traces were plotted.

Temperature, salinity, density, light transmission, dissolved oxygen, silicate, phosphate and nitrate as taken from CSS HUDSON at serial depths are reported in tabular form (Pages 2-4 to 2-23). Temperature, salinity and density, in tabular form, are reported for the Scientific Launch (Pages 2-23 to 2-310. Values of temperature, salinity, density and light transmission are taken from the down trace unless otherwise noted.

REFERENCES

Levy, E.M., C.C. Cunningham, C.D.W. Conrad, J.D. Moffat. 1977. The determination of dissolved oxygen in sea water. Bedford Institute of Oceanography Report Series/BI-R-77-9/ August.

Stickland, J.D.H., and T.R. Parsons. 1968. A practical Handbook of Seawater Analysis. Fisheries Research Board of Canada. Bulletin 167.

Syvitski, J.P.M., and C.P. Blakeney. 1983. Sedimentology of Arctic Fjords Experiment: HU-031 Data Report, Volume 1. Can. Data Rep. of Hydrography and Ocean Sciences No. 12.

STATION:CA7.1 DATE:83.09.20 LAT.:71 46.2'N LON.:74 24.5'W DEPTH:660M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/ℓ)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRAT
1	2.46	29.80	23.77		8.69	1.88	.49	.03
5	2.46	29.80	23.77		8.82	2.06	.56	.01
10	2.46	29.80	23.77		8.79	2.02	.57	.01
20	2.02	30.55	24.41		8.94	2.20	.61	.07
50	-0.35	32.31	25.95		9.07	7.30	.99	3.37
75	-1.11	32.70	26.29					
100	-1.48	32.90	26.46		7.67	15.69	1.28	9.62
300	-1.02	33.70	27.10		6.69	16.42	1.14	12.70
650	.58	34.27	27.48					

STATION:CA6.1 DATE:83.09.20 LAT.:71 43.2'N LON.:74 36.5'W DEPTH:750M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/ℓ)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRAT
1	2.66	29.52	23.54					
5	2.66	29.53	23.55		8.46	1.44	.52	.07
10	2.64	29.59	23.60		8.44	1.39	.54	.00
20	2.62	29.68	23.67		8.68	1.74	.58	.06
50	-0.75	32.53	26.14					
150	-1.45	32.99	26.54		7.36	9.70	1.09	4.74
200	-1.49	33.13	26.66		7.23	17.00	1.32	11.61
400	-0.14	34.04	27.34					
730	0.60	34.28	27.49					

STATION:CA4.2 DATE:83.09.21 LAT.:71 27.4'N LON.:74 49.5'W DEPTH:475M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/ℓ)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	2.89	28.71	22.88		8.53	1.22	.47	.02
5	2.90	28.73	22.89		8.93	1.44	.67	.04
15	2.33	30.58	24.41		8.98	1.67	.64	.17
25	1.82	31.19	24.93		9.19	1.52	.60	.00
45	0.07	32.21	25.85		9.67	1.50	.80	.35
80	-1.19	32.75	26.34		7.76	12.48	1.24	8.81
105	-1.36	32.85	26.42		7.54	14.68	1.21	9.95
305	-1.01	33.68	27.08					
460	0.41	34.22	27.46					

STATION:CA4.1 DATE:83.09.21 LAT.:71 27.5′N LON.:74 45.0′W DEPTH:515M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRATE
(M)	(°C)	(PPT)	(KG/M^3)	(%TR)	(ML/ℓ)		(μG-AT/L)	
1	2.82	29.10	23.19					
5	2.82	29.17	23.25		8.91	1.43	.53	.00
10	2.71	29.88	23.82		9.03	1.56	.59	.00
20	2.04	30.95	24.73		9.18	1.56	.70	.17
30	1.41	31.50	25.21		9.72	.90	.73	.16
45	-0.07	32.25	25.89		9.15	4.84	.98	2.46
100	-1.32	32.84	26.41		7.59	14.80	1.32	9.82
200	-1.40	33.12	26.64		7.20	17.04	1.30	11.61
500	0.47	34.23	27.46		5.35	23.60	1.28	17.11

STATION:CA1.0 DATE:83.09.22 LAT.:71 11.8′N LON.:75 2.0′W DEPTH:164M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRATE
(M)	(°C)	(PPT)	(KG/M^3)	(%TR)	(ML/ℓ)		(μG-AT/L)	
1	1.76	30.79	24.61	82.60	9.29	1.22	.59	.04
5	1.78	30.81	24.63	82.60	9.37	1.27	.60	.00
10	1.83	30.83	24.65	82.40	9.55	1.28	.64	.00
20	1.75	31.06	24.83	82.00	9.57	1.34	.72	.12
35	1.25	31.42	25.15	83.20	9.97	1.29	.70	.17
50	0.14	32.16	25.81	85.00	9.77	1.96	.89	1.04
75	-0.86	32.68	26.27	86.00	7.82	8.94	1.27	7.76
100	-1.16	32.81	26.38	86.60	7.43	13.29	1.24	9.94
163	-1.27	33.24	26.73	84.80	5.38	22.69	1.52	15.50

STATION:CA1.2 DATE:83.09.22 LAT.:71 12.6′N LON.:75 1.0′W DEPTH:201M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRATE
(M)	(°C)	(PPT)	(KG/M^3)	(%TR)	(ML/ℓ)		(μG-AT/L)	
1	2.00	30.78	24.60	81.60				
5	2.03	30.82	24.62	81.40				
10	1.94	30.88	24.68	81.80				
20	1.68	31.15	24.91	81.80				
50	0.19	32.17	25.82	84.60				
75	-0.95	32.72	26.30	86.00				
100	-1.22	32.85	26.42	86.60				
150	-1.31	33.16	26.67	86.20				
195	-1.21	33.36	26.84	84.20				

STATION:CA0.2 DATE:83.09.22 LAT.:71 11.5′N LON.:75 2.5′W DEPTH:125M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/ℓ)	SILICATE	NUTRIENTS PHOSPHATE (μG-AT/L)	NITRA
1	1.54	30.71	24.56	83.40	9.27	1.24	.70	.0
5	1.67	30.77	24.61	83.00	9.35	1.10	.70	.0
10	1.84	30.89	24.69	82.60	9.48	1.03	.71	.0
20	1.71	31.10	24.87	82.00	9.55	1.17	.81	.1
30	1.06	31.55	25.27	83.60	9.91	.99	.78	.0
50	-0.34	32.48	26.09	85.60	9.11	3.26	1.05	2.4
75	-1.09	32.77	26.35	86.40	7.51	11.43	1.35	9.4
100	-1.25	32.89	26.46	85.80	7.24	14.35	1.26	10.2
115	-1.30	33.05	26.58	84.20	6.55	17.42	1.33	11.8

STATION:CA3.0 DATE:83.09.22 LAT.:71 23.5′N LON.:74 38.0′W DEPTH:375M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/ℓ)	SILICATE	NUTRIENTS PHOSPHATE (μG-AT/L)	NITRA
1	2.59	29.15	23.25	84.00	8.57	1.28	.48	.0
10	2.69	29.49	23.51	83.20	8.84	1.23	.53	.0
20	2.32	30.57	24.41	81.60	9.04	1.52	.60	.0
40	1.59	31.36	25.08	81.80	9.44	1.34	.67	.0
75	-0.58	32.54	26.14	82.60	8.93	6.87	1.08	4.1
100	-1.14	32.75	26.33	86.00	7.73	11.80	1.30	8.7
150	-1.32	32.91	26.47	86.80	7.38	14.48	1.33	10.0
220	-1.40	33.16	26.67	86.80	7.13	16.43	1.33	11.3
360	-0.44	33.93	27.26	85.80	5.79	20.59	1.32	14.9

STATION:CA2.2 DATE:83.09.22 LAT.:71 19.4′N LON.:74 46.2′W DEPTH:285M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/ℓ)	SILICATE	NUTRIENTS PHOSPHATE (μG-AT/L)	NITRA
1	2.42	29.64	23.65	83.40	8.66	1.18	.52	.0
5	2.43	29.62	23.64	83.60	8.78	1.25	.55	.0
10	2.56	30.09	24.00	82.60	8.86	1.22	.52	.0
20	2.23	30.75	24.56	81.80	9.17	1.54	.61	.0
45	1.01	31.67	25.36	82.00	10.02	.47	.73	.1
95	-0.94	32.71	26.29	86.00	7.73	10.47	1.26	8.4
145	-1.28	32.92	26.47	86.80	7.25	14.50	1.33	10.1
200	-1.35	33.08	26.61	86.80	7.04	16.82	1.33	11.4
275	-1.26	33.44	26.90	85.80	6.55	17.07	1.25	12.85

STATION:CA1.1 DATE:83.09.22 LAT.:71 12.7′N LON.:74 59.0′W DEPTH:200M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (μG-AT/L)	NITRATE
1	1.90	30.57	24.43	82.80				
5	1.91	30.57	24.43	82.80				
10	1.91	30.57	24.43	82.80				
25	1.92	30.77	24.59	82.60				
50	1.63	31.18	24.94	81.80				
75	-0.30	32.49	26.10	85.60				
100	-1.13	32.79	26.36	86.60				
150	-1.27	33.28	26.73	85.60				
180	-1.21	33.36	26.83	84.20				

STATION:CA2 DATE:83.09.23 LAT.:71 16.4′N LON.:74 51.5′W DEPTH:329M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (μG-AT/L)	NITRATE
1	2.58	29.31	23.38	83.80	8.62	1.20	.51	.01
5	2.57	29.33	23.39	83.80	8.67	1.25	.53	.00
10	2.55	29.65	23.65	83.20	8.78	1.29	.54	.00
20	2.33	30.59	24.42	81.80	9.04	1.46	.56	.00
30	2.17	30.83	24.62	81.80	9.24	1.44	.64	.03
50	1.28	31.50	25.22	82.40	9.71	.93	.70	.15
100	-1.16	32.80	26.38	86.80	6.53	13.60	1.40	9.73
200	-1.22	33.36	26.83	86.20	3.80	31.18	1.93	18.52
315	-1.17	33.40	26.86	84.20	2.82	41.53	2.02	19.47

STATION:CA6 DATE:83.09.23 LAT.:71 35.5′N LON.:74 34.4′W DEPTH:665M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (μG-AT/L)	NITRATE
1	2.14	29.88	23.86	82.80	8.60	1.79	.66	.16
5	2.14	29.88	23.86	82.80	8.62	1.79	.54	.08
10	2.13	29.88	23.87	83.00	8.61	1.78	.55	.00
20	2.09	29.90	23.88	83.20	8.85	1.97	.61	.00
60	0.15	32.08	25.74	81.60	9.31	4.10	.89	1.50
75	-0.42	32.36	25.99	82.20	9.00	6.73	1.13	3.14
200	-1.41	33.12	26.64	86.80	7.13	16.86	1.40	11.44
450	0.41	34.23	27.46	86.40	5.53	21.62	1.35	16.29
655	0.53	34.25	27.47	85.20	5.43	22.74	1.39	16.37

STATION:CA5 DATE:83.09.23 LAT.:71 33.3′N LON.:74 44.5′W DEPTH:585M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	NUTRIENTS SILICATE	PHOSPHATE (µG-AT/L)	NITRA
1	2.08	29.87	23.86	82.60	8.56	1.51	.50	.0
5	2.08	29.88	23.86	82.80	8.57	1.63	.53	.3
10	2.08	29.88	23.86	82.80	8.58	1.60	.50	.0
20	2.08	29.88	23.87	82.80	8.63	1.57	.52	.0
70	0.15	32.15	25.80	81.00	9.38	3.33	.91	1.2
150	-1.33	32.92	26.48	86.60	7.23	15.48	1.23	10.3
200	-1.40	33.10	26.63	86.80	7.09	16.78	1.42	11.2
500	0.48	34.23	27.46	86.20	5.42		1.46	16.4
580	0.52	34.24	27.47	85.00	5.96		.99	

STATION:CA5.1 DATE:83.09.24 LAT.:71 34.8′N LON.:74 37.0′W DEPTH:500M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	NUTRIENTS SILICATE	PHOSPHATE (µG-AT/L)	NITRA
1	1.89	29.88	23.90	83.40	8.52	1.61	.48	.1
5	1.91	29.92	23.91	83.40	8.58	1.65	.50	.0
20	1.97	30.15	24.09	83.20	8.81	1.70	.57	.0
30	1.85	30.66	24.51	80.60	9.09	1.53	.57	.1
50	1.31	31.45	25.18	82.20	9.26	1.48	.63	.1
70	-0.01	32.22	25.87	81.00	9.07	4.85	.88	2.0
100	-1.13	32.69	26.29	85.00	7.89	12.52	1.14	8.0
200	-1.40	33.19	26.70	86.40	7.01	17.08	1.26	11.5
480	0.46	34.24	27.47	86.20	5.43	21.97	1.25	16.1

STATION:CA9 DATE:83.09.24 LAT.:71 49.0′N LON.:74 32.0′W DEPTH:658M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	NUTRIENTS SILICATE	PHOSPHATE (µG-AT/L)	NITRA
5	1.23	30.49	24.40	85.00	8.75	2.05	.52	.1
30	0.93	31.60	25.31	84.20	9.42	1.69	.63	.1
40	0.30	31.96	25.64	81.60	9.39	3.15	.79	.9
50	-0.36	32.27	25.91	82.40	8.64	10.57	1.17	4.9
60	-0.99	32.60	26.21	85.40	8.31	10.62	1.18	5.9
80	-1.21	32.72	26.31	86.20	8.03	15.31	1.26	7.6
150	-1.53	33.01	26.55	86.80	6.27	16.77	1.30	10.6
400	0.24	34.17	27.43	86.40	5.73	20.36	1.26	15.5
645	1.09	34.47	27.62	84.80	6.84	18.08	1.20	12.2

STATION:IT6 DATE:83.09.25 LAT.:68 52.7′N LON.:66 24.5′W DEPTH:585M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.18	29.93	23.96	86.07	8.65	1.36	.54	.03
5	1.17	29.93	23.96	86.03	8.65	1.51	.69	.24
30	1.17	31.59	25.30	82.56	9.72	4.89	.91	2.77
40	-0.59	32.32	25.96	80.97	8.92	8.99	1.05	4.94
50	-0.79	32.47	26.09	82.05	7.85			
100	-1.48	32.91	26.47	87.21	7.36	17.62	1.35	10.11
180	-1.56	33.13	26.65	87.56	7.17	17.10	1.27	10.63
400	-0.19	33.97	27.28	87.14	5.96	16.64	1.25	10.51
540	1.01	34.33	27.51	87.58	5.09	20.53	1.17	16.80

STATION:IT1.2ADATE:83.09.26 LAT.:69 20.8′N LON.:69 1.5′W DEPTH:302M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.44	29.79	23.84	86.28	8.72	2.28	.54	.04
5	1.44	29.80	23.85	86.24	8.72	2.13	.57	.04
20	1.31	30.03	24.04	86.03	9.50	2.30	.65	.04
30	0.72	31.02	24.86	85.65	9.89	2.04	.64	.04
40	0.46	31.56	25.31	86.44	10.10	1.54	.70	.05
50	0.39	32.00	25.67	86.43	10.14	1.20	.72	.24
100	-1.36	32.77	26.36	87.86	7.90	9.09	1.13	6.54
200	-1.22	33.28	26.77	87.46	6.63	16.34	1.29	11.76
290	-0.97	33.62	27.03	85.94	5.91	20.43	1.25	13.50

STATION:IT1.1 DATE:83.09.26 LAT.:69 20.0′N LON.:69 3.8′W DEPTH:256M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.33	29.86	23.89	85.58				
5	1.33	29.88	23.91	85.66	8.76	2.52	.61	.06
10	1.32	29.89	23.92	85.69				
20	1.25	30.03	24.04	85.64				
30	0.68	31.08	24.91	85.64	9.87	2.11	.60	.05
40	0.54	31.33	25.12	85.71	9.37	1.81	.62	.02
50	0.46	31.73	25.45	86.23	10.22	1.26	.63	.17
130	-1.32	33.00	26.54	85.62	7.09	13.23	1.17	9.34
250	-1.00	33.59	27.01	86.03	5.96	22.12	1.29	13.68

STATION:ITO.2 DATE:83.09.26 LAT.:69 16.4'N LON.:69 15.0'W DEPTH: 91M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M ³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
1	1.32	29.81	23.86	85.08	8.58	2.44	.48	.0
5	1.32	29.81	23.86	85.13	8.54	2.18	.49	.0
10	1.32	29.81	23.86	85.08	7.95	2.60	.53	.3
20	1.32	29.83	23.87	85.06	8.22	2.28	.52	.0
30	0.78	31.13	24.95	85.06	9.84	1.39	.52	.2
40	0.48	31.86	25.55	85.48	10.10	1.23	.61	.1
50	0.00	32.32	25.94	85.70	10.11	1.33	.63	.4
75	-0.79	32.65	26.24	85.56	9.01	3.83	.73	2.3

STATION:ITO.3 DATE:83.09.26 LAT.:69 17.5'N LON.:69 11.0'W DEPTH:155M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M ³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
1*	1.31	29.85	23.89	85.09				
5*	1.31	29.86	23.90	84.98	8.76	2.18	.50	.0
10*	1.31	29.89	23.92	84.57	8.72	2.34	.53	.0
20*	0.83	31.02	24.85	84.99	9.08	1.86	.53	
30*	0.59	31.62	25.35	85.27	9.93	1.61	.56	.0
40*	0.49	31.67	25.39	85.62	10.02	1.30	.58	.0
50*	0.24	32.16	25.80	85.81	10.16	1.12	.57	.3
100	-1.24	32.82	26.39	86.32	7.73	9.35	1.00	6.6
135	-1.31	32.95	26.50	85.01	7.26	12.50	1.03	9.1

STATION:ITO.4 DATE:83.09.26 LAT.:69 17.9'N LON.:69 12.1'W DEPTH:148M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M ³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
5*	1.36	29.86	23.89	85.27				
10*	1.35	29.86	23.89	85.28				
20*	1.35	29.86	23.89	85.19				
30*	1.10	30.41	24.35	84.43				
50*	0.46	31.89	25.57	85.84				
75	-0.19	32.47	26.07	86.26				
100	-1.04	32.77	26.34	86.27				
140	-1.31	32.98	26.53	84.72				

STATION:ITO.1BDATE:83.09.27 LAT.:69 16.4′N LON.:69 15.1′W DEPTH: 82M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.25	29.80	23.85	84.10				
5	1.25	29.80	23.85	84.60				
10	1.24	29.80	23.85	84.50				
20	1.17	29.92	23.96	83.84				
30	0.47	31.82	25.52	85.10				
40	-0.16	32.43	26.04	84.61				
50	-0.64	32.63	26.22	84.57				
70	-1.09	32.75	26.33	81.53				

STATION:ITO.1DDATE:83.09.27 LAT.:69 16.4′N LON.:69 15.1′W DEPTH: 73M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.27	29.80	23.85	83.84				
5	1.27	29.82	23.87	84.13				
10	1.26	29.82	23.87	84.18				
20	1.26	29.82	23.87	84.49				
30	0.36	31.99	25.66	84.74				
40	-0.36	32.50	26.10	83.94				
50	-0.73	32.64	26.23	86.03				
65	-1.09	32.73	26.32	83.78				

STATION:IT1.2BDATE:83.09.27 LAT.:69 1.5′N LON.:69 20.7′W DEPTH:283M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.31	29.73	23.79	84.96	8.71	2.41	.56	
5	1.30	29.82	23.87	84.97	8.72	2.22	.54	.02
10	1.30	29.83	23.87	85.00	8.81	2.23	.54	.02
20	0.74	31.02	24.86	84.07	9.36	1.98	.59	.03
50	-0.61	32.59	26.18	86.64	8.45	2.96	.77	1.69
75	-1.43	32.81	26.39	87.05	7.53	10.51	1.26	7.50
100	-1.41	32.90	26.46	87.00	7.46	12.30	1.20	8.76
200	-1.24	33.26	26.76	86.47	6.65	16.50	1.29	11.81
275	-0.98	33.60	27.02	85.29	5.94	21.63	1.31	13.87

STATION:IT2.2 DATE:83.09.27 LAT.:69 19.3'N LON.:68 54.0'W DEPTH:402M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITR
1	1.26	29.75	23.81	85.60	8.84	2.28	.52	.
5	1.24	29.84	23.89	85.56	8.76	2.26	.55	.
10	1.25	29.84	23.89	85.65	8.78	2.16	.58	
20	0.99	30.49	24.42	85.25	9.54	2.36	.59	.
30	0.44	31.32	25.11	85.57	10.07	1.55	.59	.
50	-0.01	32.39	26.00	87.10	10.13	1.10	.66	.
100	-1.46	32.87	26.44	87.62	7.10	12.06	1.15	8.
250	-1.07	33.51	26.95	86.96	5.55	19.65	1.27	13.
385	-0.93	33.65	27.05	85.73	4.95	23.13	1.27	13.

STATION:IT2.1 DATE:83.09.28 LAT.:69 20.3'N LON.:68 51.2'W DEPTH:348M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITR
1	1.17	29.93	23.96	85.85	8.90	2.46	.61	.
5	1.15	29.99	24.01	85.87	8.84	2.30	.54	.
10	1.15	29.99	24.01	85.86	8.93	2.36	.55	.
20	0.76	30.82	24.69	85.67	9.28	2.47	.53	.
30	0.39	31.31	25.11	85.48	9.84	2.33	.65	.
50	-0.01	32.37	25.98	86.84	10.35	1.20	.65	.
100	-1.39	32.89	26.46	87.70	7.48	12.80	1.39	8.
250	-1.06	33.59	27.01	86.49	6.09	20.37	1.47	13.
330	-1.01	33.68	27.09	86.19	6.12	21.88	1.30	13.

STATION:IT2.3 DATE:83.09.28 LAT.:69 17.5'N LON.:68 28.0'W DEPTH:410M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITR
1	0.66	30.65	24.57	85.38	9.21	2.76	.53	.
5	0.67	30.67	24.58	85.55	9.34	3.20	.63	.
10	0.66	30.67	24.59	85.56	9.40	3.24	.66	.
20	0.42	30.93	24.81	85.02	9.59	3.94	.66	.
30	0.15	31.43	25.22	86.29	9.98	2.28	.67	.
100	-1.47	32.78	26.37	87.84	7.58	11.43	1.15	7.
200	-1.21	33.30	26.78	87.57	6.63	16.67	1.32	11.
300	-1.02	33.68	27.09	86.95	6.00	21.31	1.20	13.
395	-0.98	33.72	27.11	84.51	5.87	24.11	1.31	13.

STATION:IT3.0 DATE:83.09.28 LAT.:69 17.0′N LON.:68 22.1′W DEPTH:425M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.14	29.99	24.01	85.50				
5	1.15	30.01	24.02	85.60				
10	1.03	30.20	24.19	85.36				
25	0.06	31.36	25.17	86.14				
50	-0.36	32.45	26.06	87.34				
100	-1.48	32.83	26.41	87.50				
200	-1.29	33.31	26.79	87.51				
400	-0.98	33.71	27.10	84.60				

STATION:IT3.1 DATE:83.09.28 LAT.:69 17.6′N LON.:68 12.3′W DEPTH:356M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	1.02	30.05	24.07	85.46	8.94	2.59	.54	.16
5	1.02	30.07	24.08	85.58	9.11	2.98	.55	.17
20	0.15	31.14	24.98	85.18	9.67	3.69	.69	.58
30	0.03	31.69	25.43	86.60	10.01	2.56	.67	.33
50	-0.37	32.36	25.99	87.26	9.57	2.93	.77	.93
75	-0.81	32.60	26.21	87.49	8.84	4.04	.83	2.23
100	-1.49	32.79	26.37	87.58	7.79	9.92	1.03	6.74
270	-1.06	33.65	27.06	86.49	6.05	21.11	1.22	13.34
345	-1.00	33.69	27.09	86.37	5.99	21.53	1.23	13.58

STATION:IT5 DATE:83.09.29 LAT.:69 4.2′N LON.:67 10.0′W DEPTH:265M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	0.97	30.08	24.10	83.77				
5	0.94	30.23	24.21	84.28				
10	0.94	30.23	24.21	84.32				
25	1.02	30.54	24.46	83.26				
50	-0.65	32.20	25.87	85.41				
100	-1.48	32.90	26.47	87.61				
200	-1.42	33.23	26.73	87.18				
260	-1.28	33.45	26.91	86.74				

STATION:MC5.1 DATE:83.09.29 LAT.:69 34.3'N LON.:68 21.4'W DEPTH: M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRA
(M)	(°C)	(PPT)	(KG/M³)	(%TR)	(ML/L)		(G-AT/L)	
1	0.84	28.78	23.06	84.65				
10	0.82	29.44	23.58	85.00				
20	0.82	29.60	23.72	83.80				
30	0.91	30.56	24.48	82.00				
40	-0.16	31.65	25.41	79.70				
50	-0.64	32.06	25.76	83.01				
60	-0.95	32.43	26.07	87.15				
80	-1.34	32.64	26.25	87.63				
100	-1.32	32.79	26.37	87.42				

STATION:MC5.0 DATE:83.09.29 LAT.:69 36.5'N LON.:68 37.9'W DEPTH: M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRA
(M)	(°C)	(PPT)	(KG/M³)	(%TR)	(ML/L)		(G-AT/L)	
1	0.92	28.83	23.09	84.97				
10	0.88	29.18	23.38	85.39				
20	1.01	29.40	23.54	83.98				
30	0.66	30.58	24.51	82.52				
40	0.08	31.34	25.15	79.45				
50	-0.42	31.81	25.55	80.77				
60	-0.75	32.15	25.84	86.41				
80	-1.34	32.63	26.25	87.25				
100	-1.33	32.69	26.29	87.12				

STATION:MC4.1 DATE:83.09.29 LAT.:69 36.9'N LON.:68 44.3'W DEPTH: M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRA
(M)	(°C)	(PPT)	(KG/M³)	(%TR)	(ML/L)		(G-AT/L)	
1	0.84	29.28	23.46	84.43				
10	0.85	29.30	23.47	85.09				
20	0.86	29.35	23.51	85.07				
30	0.92	29.75	23.83	82.62				
40	0.19	31.22	25.05	79.32				
50	-0.37	31.92	25.64	86.15				
60	-0.79	32.37	26.02	86.97				
80	-1.25	32.61	26.22	87.14				
100	-1.28	32.74	26.33	86.88				

STATION:MC3.1 DATE:83.09.29 LAT.:69 34.4′N LON.:68 58.5′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRATE
1	0.95	29.41	23.55	83.96				
10	0.94	29.41	23.56	84.32				
20	0.96	29.46	23.60	84.57				
30	1.00	29.61	23.71	84.17				
40	0.38	31.16	24.99	85.43				
50	-0.58	32.16	25.83	86.30				
60	-0.87	32.43	26.07	86.68				
80	-1.25	32.64	26.25	86.95				
100	-1.24	32.77	26.35	86.36				

STATION:MC3 DATE:83.09.29 LAT.:69 31.3′N LON.:69 15.5′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRATE
1	0.96	29.32	23.48	84.42				
10	0.95	29.41	23.55	84.80				
20	0.96	29.43	23.57	84.79				
30	0.97	29.45	23.59	84.64				
40	0.88	29.69	23.79	84.72				
50	-0.34	32.04	25.73	86.90				
60	-0.78	32.37	26.02	86.80				
80	-1.19	32.63	26.24	86.83				
100	-1.25	32.81	26.39	86.25				

STATION:MC2.1 DATE:83.09.29 LAT.:69 32.1′N LON.:69 27.3′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRATE
1	1.00	29.43	23.57	84.02				
10	1.01	29.45	23.59	84.80				
20	1.01	29.47	23.60	84.80				
30	1.00	29.48	23.61	84.84				
40	0.96	29.63	23.73	84.92				
50	-0.41	32.09	25.79	86.89				
60	-0.86	32.46	26.09	86.94				
80	-1.13	32.62	26.23	86.52				
100	-1.22	32.74	26.33	86.09				

STATION:MC2   DATE:83.09.29 LAT.:69 33.5′N LON.:69 38.2′W DEPTH: M

DEPTH (M)	TEMP. ($^\circ$C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRA
1	1.01	29.51	23.64	84.21				
10	1.03	29.54	23.65	84.56				
20	1.05	29.56	23.67	84.44				
30	1.08	29.62	23.72	84.38				
40	1.08	29.65	23.74	84.51				
50	0.13	31.49	25.27	84.96				
60	-0.84	32.43	26.07	86.95				
80	-1.15	32.64	26.25	86.42				
100	-1.23	32.81	26.38	85.87				

STATION:MC0.2 DATE:83.09.29 LAT.:69 32.5′N LON.:69 49.5′W DEPTH: M

DEPTH (M)	TEMP. ($^\circ$C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRA
1	1.10	29.60	23.70	83.96				
10	1.11	29.60	23.70	84.01				
20	1.11	29.60	23.70	83.98				
30	1.10	29.62	23.72	84.32				
40	1.07	29.64	23.73	84.60				
50	-0.27	31.87	25.59	86.58				
60	-0.86	32.47	26.09	86.35				
80	-1.13	32.63	26.24	86.28				
100	-1.20	32.78	26.36	85.74				

STATION:MC0.1 DATE:83.09.29 LAT.:69 31.9′N LON.:70 0.0′W DEPTH: M

DEPTH (M)	TEMP. ($^\circ$C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRA
1	1.12	29.47	23.60	81.07				
10	1.15	29.48	23.60	81.36				
20	1.16	29.49	23.61	82.55				
30	1.16	29.50	23.62	82.57				
40	1.21	29.53	23.64	82.46				
50	1.18	29.59	23.69	83.44				
60	-0.70	32.27	25.93	80.22				
80	-1.02	32.57	26.18	80.32				
100	-1.15	32.70	26.29	82.39				

STATION:MC0.1 DATE:83.09.29 LAT.:69 31.9'N LON.:70 0.0'W DEPTH: 98M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRATE
(M)	(°C)	(PPT)	(KG/M³)	(%TR)	(ML/L)		(µG-AT/L)	
1	1.15	29.53	23.64	81.46	8.72	2.34	.54	.12
5	1.15	29.53	23.64	81.47	8.68	2.17	.49	.21
10	1.15	29.52	23.64	81.69	8.67	2.45	.51	.14
20	1.14	29.51	23.63	81.48	8.69	2.35	.53	.21
30	1.15	29.50	23.62	82.36	8.66	2.34	.55	.10
50	1.15	29.70	23.78	83.54	8.65	5.09	.79	2.88
75	-0.98	32.54	26.16	79.05	7.96	8.32	1.04	6.42
92	-1.14	32.68	26.28	83.15	7.59	8.96	1.08	7.90

STATION:MC2.0 DATE:83.09.30 LAT.:69 33.5'N LON.:69 40.2'W DEPTH:320M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRATE
(M)	(°C)	(PPT)	(KG/M³)	(%TR)	(ML/L)		(µG-AT/L)	
1	0.97	29.30	23.46	85.20				
5	0.97	29.60	23.71	85.24	8.89	2.16	.56	.12
10	0.98	29.60	23.71	85.29	8.78	2.47	.80	.17
20	1.03	29.63	23.73	85.33	8.83	2.41	.67	.07
30	1.07	29.65	23.74	85.51	8.83	2.70	.58	.27
50	-0.63	32.26	25.92	87.70	8.71	5.95	.88	3.60
100	-1.22	32.78	26.37	86.79	7.15	12.69	1.53	9.62
165	-1.33	33.19	26.70	85.82	6.08	18.13	1.42	13.02
250	-1.30	33.41	26.88	85.77	5.18	22.20	1.56	15.17
310	-1.28	33.45	26.91	83.53	4.59	24.96	1.54	16.21

STATION:MC1.2 DATE:83.09.30 LAT.:69 32.4'N LON.:69 50.1'W DEPTH:283M

				ATTEN	DISSOLVED		NUTRIENTS	
DEPTH	TEMP.	SALINITY	SIGMA-θ	UANCE	OXYGEN	SILICATE	PHOSPHATE	NITRATE
(M)	(°C)	(PPT)	(KG/M³)	(%TR)	(ML/L)		(µG-AT/L)	
1	0.94	29.56	23.68	85.21				
10	1.04	29.61	23.71	84.47				
20	1.05	29.62	23.72	84.56				
30	1.06	29.62	23.72	84.49				
40	0.25	30.79	24.70	86.56				
50	-0.85	32.41	26.05	87.22				
60	-1.09	32.59	26.20	86.65				
80	-1.23	32.72	26.31	86.52				
100	-1.30	32.85	26.42	86.22				

STATION:MCO.1 DATE:83.09.30 LAT.:69 31.0'N LON.:69 57.0'W DEPTH:151M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITR
1	1.09	29.26	23.43	80.65				
10	1.13	29.44	23.57	80.90				
20	1.14	29.49	23.61	81.68				
30	1.12	29.60	23.70	82.85				
40	-0.01	31.53	25.32	81.37				
50	-0.78	32.39	26.03	84.70				
60	-1.02	32.55	26.17	85.82				
80	-1.16	32.70	26.30	85.68				
100	-1.24	32.84	26.41	85.88				

STATION:MCO.1 DATE:83.09.30 LAT.:69 31.0'N LON.:69 57.0'W DEPTH:180M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
1	1.19	28.78	23.04	81.47	8.75	2.21	.49	.
5	1.20	29.43	23.56	81.55	8.72	2.30	.51	.
10	1.19	29.53	23.64	81.94	8.73	2.19	.53	.
20	1.13	29.60	23.70	84.39	8.72	2.33	.52	.
50	-0.86	32.44	26.08	85.20	8.35	6.95	1.01	4.
75	-1.14	32.66	26.26	86.16	7.62	9.59	1.07	8.
100	-1.23	32.82	26.40	85.87	7.21	12.52	1.19	9.
135	-1.31	32.96	26.51	86.15	6.94	14.08	1.30	10.
175	-1.33	33.15	26.67	84.14	6.18	16.83	1.48	12.

STATION:MCO.1 DATE:83.09.30 LAT.:69 31.0'N LON.:69 57.0'W DEPTH:135M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
1	.85	28.73	23.01	78.98				
10	1.20	29.44	23.57	82.17				
20	1.17	29.55	23.65	82.51				
30	1.12	29.60	23.70	84.09				
40	-0.40	32.24	25.90	80.43				
50	-0.93	32.50	26.12	81.62				
60	-1.05	32.58	26.19	81.87				
80	-1.15	32.70	26.29	83.73				
100	-1.22	32.82	26.40	85.59				

STATION:MC2.1 DATE:83.09.30 LAT.:69 32.2′N LON.:69 27.3′W DEPTH:320M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	0.97	28.69	22.98	85.45	8.34	1.89	.52	.32
5	0.98	29.51	23.64	85.27	8.81	2.12	.46	.10
10	1.01	29.54	23.66	85.19	8.84	1.83	.48	.03
20	1.04	29.62	23.72	85.00	8.80	1.99	.45	.11
30	1.08	29.66	23.75	85.14	9.24	2.88	.55	.59
50	-0.73	32.34	25.99	87.83	8.43	6.80	.91	4.59
100	-1.26	32.84	26.41	86.85	7.25	13.59	1.11	9.89
175	-1.33	33.22	26.72	85.86	6.14	17.57	1.27	13.18
310	-1.28	33.54	26.98	85.45	6.03	26.93	1.42	15.59

STATION:MC5.0 DATE:83.10.01 LAT.:69 36.5′N LON.:68 34.9′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	0.60	28.43	22.78	86.40				
10	0.90	29.41	23.55	85.85				
20	0.90	29.84	23.91	84.99				
30	0.32	31.24	25.06	82.39				
40	-0.59	32.03	25.73	83.63				
50	-0.82	32.22	25.89	85.97				
60	-1.09	32.53	26.15	87.87				
80	-1.33	32.62	26.24	87.94				
100	-1.28	32.74	26.33	87.63				

STATION:MC4.1 DATE:83.10.01 LAT.:69 36.9′N LON.:68 44.3′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA- θ (KG/M^3)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE µ G-AT/L)	NITRATE
1	0.81	29.37	23.53	85.88				
10	0.77	29.36	23.52	86.12				
20	0.88	29.91	23.96	84.93				
30	0.06	31.42	25.22	81.55				
40	-0.53	31.96	25.68	82.66				
50	-0.83	32.35	26.00	87.55				
60	-1.05	32.53	26.15	87.81				
80	-1.34	32.63	26.24	87.81				
100	-1.30	32.83	26.40	87.43				

STATION:MC3.1 DATE:83.10.01 LAT.:69 34.4′N LON.:68 58.5′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRAT
1	0.89	29.48	23.61	85.37				
10	0.90	29.48	23.62	85.57				
20	0.97	29.52	23.64	85.29				
30	0.27	31.31	25.12	87.36				
40	-0.51	32.08	25.77	87.29				
50	-0.75	32.33	25.98	87.45				
60	-1.14	32.57	26.19	87.64				
80	-1.26	32.72	26.31	87.58				
100	-1.30	32.85	26.42	87.38				

STATION:MC3 DATE:83.10.01 LAT.:69 31.3′N LON.:69 15.5′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRAT
1	0.93	29.53	23.65	85.34				
10	0.88	29.50	23.63	85.55				
20	1.04	29.70	23.78	84.85				
30	0.25	31.29	25.10	86.15				
40	-0.25	31.90	25.62	87.64				
50	-0.78	32.39	26.03	87.82				
60	-1.09	32.57	26.19	87.44				
80	-1.21	32.69	26.29	87.24				
100	-1.29	32.87	26.43	86.96				

STATION:MC2.2 DATE:83.10.01 LAT.:69 31.4′N LON.:69 21.0′W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRAT
1	0.89	29.54	23.66	85.43				
10	0.89	29.54	23.66	85.53				
20	1.03	29.60	23.70	85.09				
30	0.14	31.43	25.21	86.54				
40	-0.42	32.06	25.75	87.79				
50	-0.81	32.39	26.03	87.78				
60	-1.11	32.57	26.18	87.55				
80	-1.21	32.71	26.30	87.30				
100	-1.28	32.84	26.41	87.22				

STATION:MC2.1 DATE:83.10.01 LAT.:69 32.2'N LON.:69 27.3'W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRATE
1	0.92	29.44	23.58	85.21				
10	0.95	29.48	23.61	85.40				
20	1.05	29.61	23.71	85.09				
30	0.12	31.36	25.16	87.06				
40	-0.39	32.05	25.74	87.77				
50	-0.76	32.34	25.99	87.39				
60	-1.07	32.55	26.17	87.52				
80	-1.21	32.71	26.30	87.21				
100	-1.27	32.84	26.41	86.85				

STATION:MC2.0 DATE:83.10.01 LAT.:69 33.5'N LON.:69 40.2'W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRATE
1	0.96	29.57	23.69	85.21				
10	0.95	29.57	23.69	85.37				
20	1.06	29.61	23.71	85.17				
30	-0.04	31.73	25.47	87.54				
40	-0.54	32.20	25.86	87.64				
50	-0.92	32.48	26.11	87.60				
60	-1.08	32.59	26.20	87.40				
80	-1.17	32.70	26.30	86.80				
100	-1.23	32.82	26.39	86.69				

STATION:MC0.2 DATE:83.10.01 LAT.:69 32.4'N LON.:69 50.0'W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)	ATTENUANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRATE
1	1.04	29.56	23.67	81.24				
10	1.03	29.57	23.68	82.62				
20	1.05	29.59	23.70	85.11				
30	0.18	30.92	24.80	86.66				
40	-0.64	32.31	25.96	87.53				
50	-0.95	32.51	26.13	87.57				
60	-1.09	32.60	26.21	87.15				
80	-1.17	32.70	26.30	86.86				
100	-1.25	32.85	26.42	86.67				

STATION:MC0.1 DATE:83.10.01 LAT.:69 31.0'N LON.:69 57.0'W DEPTH: M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (G-AT/L)	NITRA
1	0.72	29.22	23.42	78.91				
10	1.03	29.40	23.55	81.25				
20	1.13	29.57	23.68	80.90				
30	0.21	31.09	24.94	85.11				
40	-0.66	32.29	25.95	87.16				
50	-0.93	32.50	26.12	83.24				
60	-1.07	32.60	26.21	83.30				
80	-1.16	32.70	26.29	84.00				
100	-1.25	32.86	26.42	85.24				

STATION:MC4.1 DATE:83.10.01 LAT.:69 36.6'N LON.:68 44.5'W DEPTH:549M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
1	0.76	29.35	23.52	85.80	8.80	1.83	.52	.0
5	0.76	29.37	23.53	85.90	8.80	1.88	.55	.0
10	0.77	29.37	23.53	85.86	8.85	2.70	.60	.1
30	0.47	30.93	24.80	81.48	9.24	3.34	.70	.7
40	-0.13	31.65	25.41	81.67	9.55	2.72	.76	.7
50	-0.65	32.23	25.89	87.69	9.34	4.46	.77	1.5
125	-1.35	32.92	26.48	87.57	7.26	14.78	1.22	10.3
300	-1.30	33.53	26.97	87.37	5.33	25.47	1.45	15.1
530	-1.32	33.63	27.05	83.18	4.92	35.26	1.56	15.7

STATION:MC3.05DATE:83.10.01 LAT.:69 33.5'N LON.:69 1.0'W DEPTH:540M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRA
1	0.86	29.47	23.60	85.31	8.89	1.88	.50	.1
5	0.86	29.49	23.63	85.33	8.84	1.76	.50	.0
10	0.88	29.50	23.64	85.34	9.15	1.86	.57	.0
20	0.90	29.53	23.65	85.29	9.04	2.58	.55	.1
30	0.65	30.28	24.27	85.09	9.72	2.16	.63	.2
100	-1.29	32.76	26.35	87.77	7.48	12.49	1.19	9.2
200	-1.37	33.27	26.77	87.03	6.21	17.10	1.28	13.2
350	-1.29	33.55	26.99	86.99	5.19	26.98	1.40	15.4
525	-1.32	33.63	27.05	83.21	4.94	30.66	1.43	15.8

STATION:MC10 DATE:83.10.02 LAT.:69 36.3'N LON.:167 20.0'W DEPTH:285M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)	ATTEN UANCE (%TR)	DISSOLVED OXYGEN (ML/L)	SILICATE	NUTRIENTS PHOSPHATE (µG-AT/L)	NITRATE
1	0.91	30.01	24.04	85.46	8.67	1.26	.50	.02
5	0.88	30.24	24.23	85.59	8.69	1.32	.55	.06
10	0.89	30.25	24.24	85.57	8.69	1.30	.52	.01
20	1.07	30.36	24.32	85.46	8.71	1.34	.55	.03
40	0.95	31.09	24.91	84.34	8.79	1.54	.56	.05
50	1.03	31.41	25.16	84.46	8.75	4.37	.76	1.65
100	-1.40	32.79	26.37	87.70	7.57	14.23	1.18	8.31
200	-1.39	33.23	26.73	87.78	6.42	19.24	1.23	12.30
277	-1.36	33.37	26.84	84.47	5.62	27.73	1.47	13.98

STATION:CA1S1 DATE:83.09.21 LAT.:71 11.2'N LON.:75 4.1'W DEPTH: 44M

DEPTH (M)	TEMP. (° C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.58	30.64	24.51
5	1.71	30.86	24.68
10	1.58	31.14	24.91
20	1.44	31.25	25.00
30	1.11	31.37	25.12
40	0.14	31.59	25.34

STATION:CA1S2 DATE:83.09.21 LAT.:71 11.2'N LON.:75 4.1'W DEPTH: 44M

DEPTH (M)	TEMP. (° C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.60	30.65	24.52
5	1.72	30.92	24.72
10	1.63	31.11	24.88
20	1.15	31.24	25.01
30	1.37	31.31	25.06
40	0.17	31.75	25.48

STATION:CA1S3 DATE:83.09.21 LAT.:71 11.2′N LON.:75 4.1′W DEPTH: 44M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.61	30.67	24.53
5	1.73	30.88	24.69
10	1.64	31.10	24.87
20	1.14	31.21	24.99
30	1.38	31.30	25.05
40	0.24	31.69	25.42

STATION:CA1S4 DATE:83.09.21 LAT.:71 11.2′N LON.:75 4.1′W DEPTH: 44M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.65	30.65	24.51
5	1.71	30.93	24.73
10	1.66	31.09	24.86
20	1.46	31.17	24.94
30	0.70	31.25	25.05
40	0.46	31.52	25.26

STATION:CA1S5 DATE:83.09.21 LAT.:71 11.2′N LON.:75 4.1′W DEPTH: 44M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.62	30.68	24.54
5	1.69	30.97	24.77
10	1.68	31.09	24.86
20	0.83	31.18	24.99
30	0.53	31.31	25.10
40	0.45	31.46	25.23

STATION:CA1S6 DATE:83.09.21 LAT.:71 11.2′N LON.:75 4.1′W DEPTH: 44M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.61	30.64	24.50
5	1.68	30.89	24.70
10	1.19	31.08	24.88
20	0.95	31.14	24.95
30	0.57	31.25	25.05
40	0.72	31.42	25.19

STATION:CA1S8 DATE:83.09.21 LAT.:71 11.2'N LON.:75 4.1'W DEPTH: 44M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.65	30.78	24.62
5	1.68	30.96	24.76
10	1.71	31.06	24.84
20	1.32	31.15	24.93
30	0.37	31.38	25.17
40	0.35	31.62	25.37

STATION:CA S9 DATE:83.09.22 LAT.:71 11.5'N LON.:75 2.7'W DEPTH:144M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.41	30.71	24.58
10	1.77	30.93	24.73
20	1.63	31.12	24.89
30	1.32	31.35	25.09
40	0.23	32.03	25.70
50	-0.32	32.46	26.07
60	-0.87	32.66	26.26
80	-1.19	32.78	26.36
100	-1.31	32.89	26.45
120	-1.37	33.10	26.62

STATION:CA S10DATE:83.09.22 LAT.:71 11.2'N LON.:75 4.1'W DEPTH: 47M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.60	30.60	24.48
5	1.63	30.72	24.57
10	1.73	30.91	24.72
20	1.68	31.06	24.84
30	0.53	31.47	25.23
40	0.34	31.90	25.59

STATION:CA S11DATE:83.09.22 LAT.:71 11.2'N LON.:75 4.1'W DEPTH: 47M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.57	30.63	24.50
5	1.66	30.71	24.56
10	1.79	30.83	24.65
20	1.06	30.99	24.82
30	0.86	31.09	24.91
40	0.59	31.48	25.24

STATION:CA S12DATE:83.09.22 LAT.:71 11.2′N LON.:75 4.1′W DEPTH: 47M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)
1	1.47	30.60	24.48
5	1.60	30.69	24.55
10	1.21	30.96	24.78
20	1.02	31.00	24.83
30	0.58	31.13	24.96
40	0.74	31.39	25.16
45	0.57	31.51	25.26

STATION:CA S15DATE:83.09.22 LAT.:71 12.0′N LON.:75 5.0′W DEPTH: 53M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)
1	1.78	30.67	24.52
5	1.79	30.68	24.52
10	1.75	30.75	24.58
20	1.68	30.84	24.66
30	1.65	31.04	24.82
40	-0.36	32.47	26.08
50	-0.97	32.78	26.35

STATION:CA S16DATE:83.09.22 LAT.:71 11.8′N LON.:75 3.3′W DEPTH:158M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)
1	1.67	30.51	24.40
10	1.85	30.69	24.53
20	1.74	30.82	24.65
30	1.80	30.95	24.74
40	1.55	31.14	24.91
50	1.04	31.51	25.24
60	0.13	32.16	25.81
80	-1.07	32.74	26.32
100	-1.30	32.86	26.43
120	-1.38	33.08	26.61

STATION:CA S17DATE:83.09.22 LAT.:71 12.0′N LON.:75 5.2′W DEPTH: 55M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^3)
1	1.67	30.40	24.31
5	1.69	30.61	24.47
10	1.76	30.68	24.52
20	1.71	30.79	24.62
30	1.67	31.01	24.80
40	-0.36	32.47	26.08
50	-0.97	32.78	26.35

STATION:CA S18DATE:83.09.24 LAT.:71 33.5'N LON.:74 36.6'W DEPTH:122M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.49	29.20	23.36
10	1.99	30.06	24.02
20	1.89	30.42	24.32
30	1.81	30.72	24.56
40	1.45	31.30	25.05
50	1.06	31.56	25.27
60	0.72	31.78	25.47
80	-0.73	32.51	26.13
95	-1.10	32.65	26.26

STATION:CA S19DATE:83.09.24 LAT.:71 33.3'N LON.:74 36.6'W DEPTH: 85M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.44	29.10	23.28
5	2.00	30.00	23.97
10	2.02	30.11	24.05
20	1.96	30.34	24.24
30	1.69	30.86	24.67
40	1.27	31.35	25.10
50	1.12	31.53	25.25
60	0.65	31.81	25.50
75	-0.53	32.43	26.05

STATION:CA S20DATE:83.09.24 LAT.:71 33.1'N LON.:74 36.7'W DEPTH: 48M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.56	29.08	23.26
5	2.02	30.02	23.98
10	2.03	30.07	24.03
20	1.84	30.46	24.35
30	1.71	30.80	24.63
40	1.11	31.42	25.16

STATION:MC S22DATE:83.10.01 LAT.:69 31.7'N LON.:69 58.2'W DEPTH: 82M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.12	29.40	23.54
5	1.10	29.47	23.60
10	1.10	29.60	23.70
20	1.06	29.63	23.72
30	-0.49	32.15	25.82
40	-0.86	32.43	26.07
50	-1.07	32.56	26.18
60	-1.17	32.64	26.25
75	-1.23	32.71	26.30

STATION:MC S23DATE:83.10.01 LAT.:69 31.6'N LON.:69 59.2'W DEPTH: 80M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	0.78	29.33	23.50
5	1.16	29.49	23.61
10	1.17	29.55	23.65
20	1.08	29.62	23.72
30	-0.49	32.15	25.83
40	-0.81	32.38	26.02
50	-1.04	32.54	26.17
60	-1.16	32.62	26.23
75	-1.22	32.71	26.30

STATION:MC S24DATE:83.10.01 LAT.:69 31.8'N LON.:69 53.0'W DEPTH:230M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.09	29.39	23.54
10	1.11	29.53	23.64
20	1.02	29.58	23.69
30	-0.34	32.04	25.73
50	-1.07	32.55	26.17
75	-1.25	32.72	26.31
100	-1.33	32.87	26.44
150	-1.41	33.16	26.67
200	-1.41	33.34	26.82
220	-1.41	33.37	26.85

STATION:MC S25DATE:83.10.01 LAT.:69 31.6'N LON.:69 59.2'W DEPTH:105M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	0.74	29.17	23.38
10	1.08	29.54	23.65
20	1.08	29.58	23.68
30	-0.47	32.10	25.79
40	-0.78	32.34	25.99
50	-1.00	32.49	26.12
60	-1.15	32.61	26.22
80	-1.24	32.73	26.32
100	-1.32	32.87	26.44

STATION:MC S26DATE:83.10.01 LAT.:69 32.2'N LON.:69 51.7'W DEPTH:240M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.11	29.53	23.65
10	1.12	29.58	23.68
20	1.02	29.62	23.72
30	-0.32	32.03	25.72
50	-1.02	32.53	26.15
75	-1.24	32.73	26.32
100	-1.33	32.89	26.45
150	-1.41	33.14	26.66
200	-1.41	32.35	26.83

STATION:MC S27DATE:83.10.01 LAT.:69 31.5'N LON.:69 51.0'W DEPTH: 50M

DEPTH (M)	TEMP. (° C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	0.95	29.43	23.57
5	0.96	29.43	23.57
10	0.96	29.43	23.57
20	1.11	29.58	23.69
30	-0.39	32.08	25.77
40	-0.84	32.42	26.05

STATION:MC S28DATE:83.10.01 LAT.:69 32.5'N LON.:69 52.4'W DEPTH: 73M

DEPTH (M)	TEMP. (° C)	SALINITY (PPT)	SIGMA-θ (KG/M³)
1	1.05	29.61	23.71
5	1.05	29.61	23.71
10	1.05	29.62	23.72
20	0.99	29.69	23.78
30	-0.30	31.97	25.68
40	-0.49	32.15	25.83
50	-0.87	32.44	26.07

STATION:MC2.0SDATE:83.10.01 LAT.:69 33.6′N LON.:69 40.0′W DEPTH:310M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^{3})
1	1.01	29.52	23.64
10	1.00	29.57	23.68
20	1.02	29.62	23.72
30	-0.24	31.78	25.51
50	-1.00	32.49	26.12
75	-1.21	32.66	26.26
100	-1.34	32.89	26.45
150	-1.41	33.10	26.63
200	-1.43	33.40	26.87

STATION:MC2.1SDATE:83.10.01 LAT.:69 32.0′N LON.:69 28.0′W DEPTH:310M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^{3})
1	0.96	29.53	23.65
10	0.93	29.60	23.71
20	0.70	30.28	24.26
30	-0.31	31.83	25.56
50	-0.95	32.47	26.10
75	-1.25	32.68	26.28
100	-1.32	32.83	26.40
150	-1.42	33.07	26.60

STATION:MC S31DATE:83.10.01 LAT.:69 31.2′N LON.:69 25.8′W DEPTH: 40M

DEPTH (M)	TEMP. (°C)	SALINITY (PPT)	SIGMA-θ (KG/M^{3})
1	0.83	29.56	23.68
5	0.86	29.57	23.69
10	0.90	29.59	23.70
20	0.92	29.64	23.74
30	-0.30	31.97	25.67
35	-0.62	32.24	25.91

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STATION:MC3.0SDATE:83.10.01 LAT.:69 31.5'N LON.:69 15.2'W DEPTH:460M

DEPTH   TEMP.   SALINITY   SIGMA-θ
 (M)    (°C)     (PPT)    (KG/M³)

 1       0.94    29.54     23.66
 10      0.95    29.57     23.68
 20      0.71    30.25     24.24
 30     -0.23    31.67     25.43
 50     -0.73    32.30     25.95
 75     -1.33    32.67     26.27
 100    -1.34    32.81     26.39
 125    -1.40    32.96     26.51
 150    -1.45    33.06     26.59

STATION:MC S33DATE:83.10.01 LAT.:69 33.3'N LON.:69  2.4'W DEPTH:    M

DEPTH   TEMP.   SALINITY   SIGMA-θ
 (M)    (°C)     (PPT)    (KG/M³)

 1       0.82    29.50     23.63
 10      0.84    29.52     23.65
 20      0.88    29.59     23.70
 30      0.27    31.16     25.00
 50     -0.86    32.41     26.05
 75     -1.37    32.67     26.28
 100    -1.37    32.84     26.41
 125    -1.44    32.98     26.53
 150    -1.46    33.07     26.60
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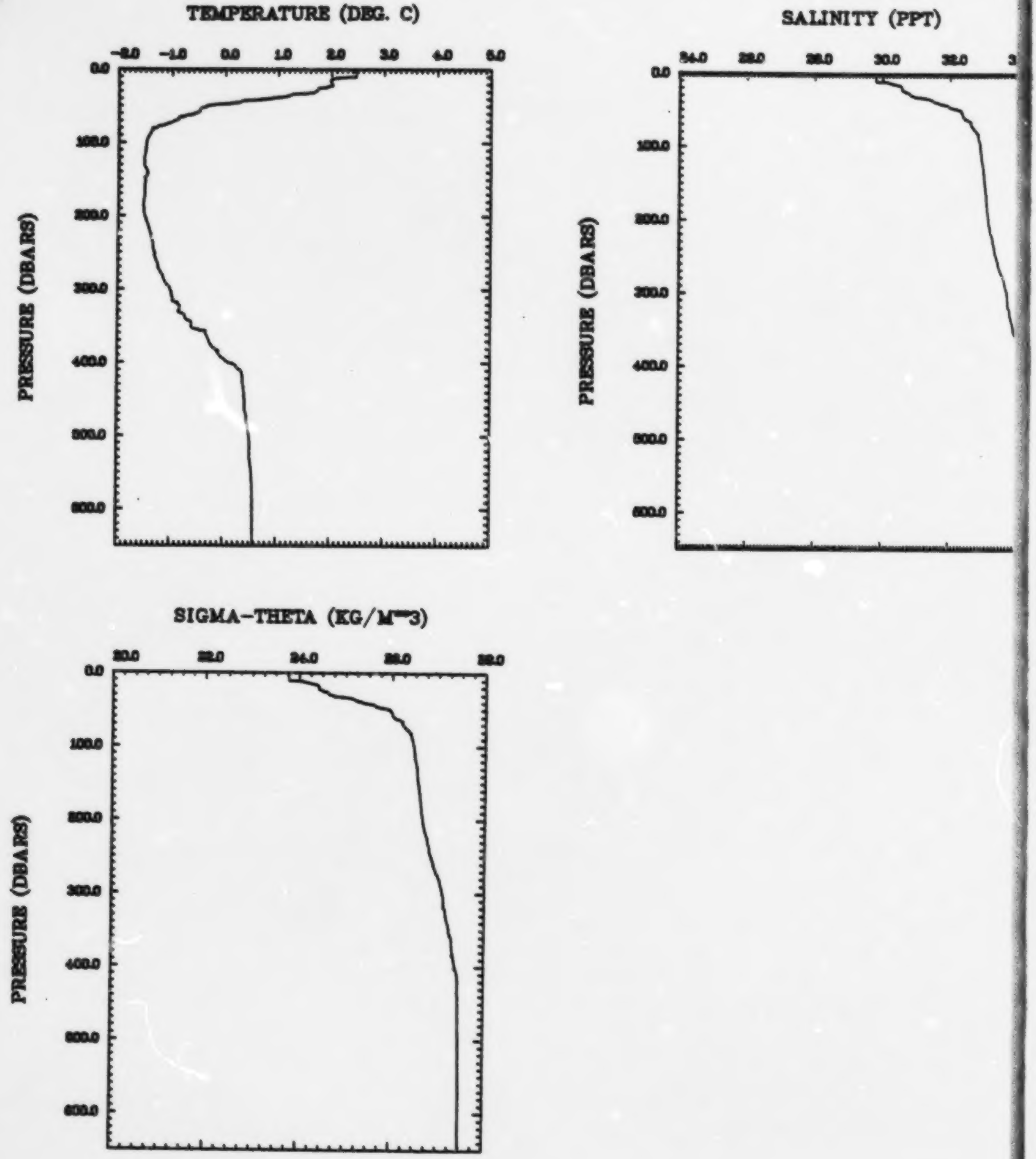
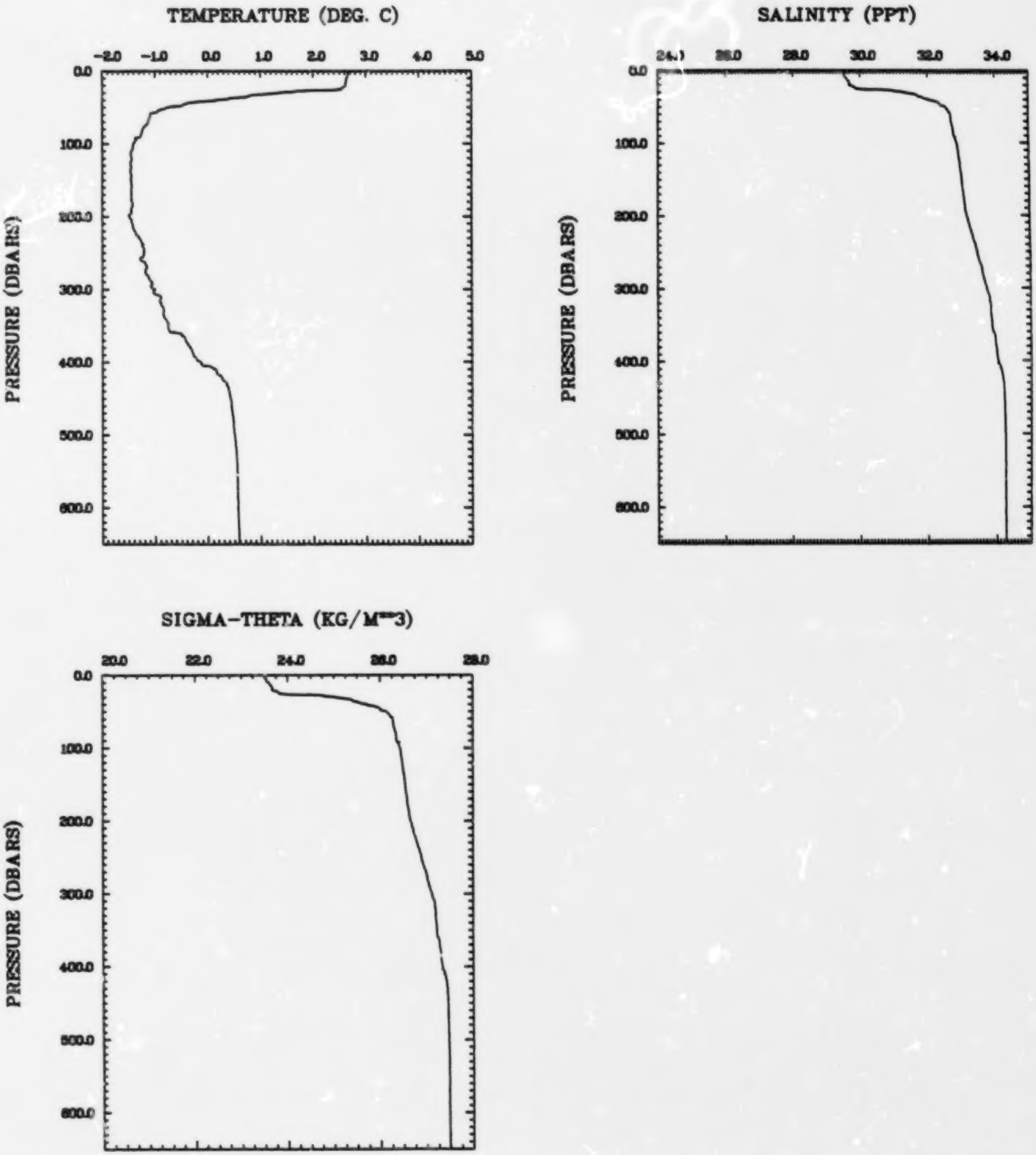
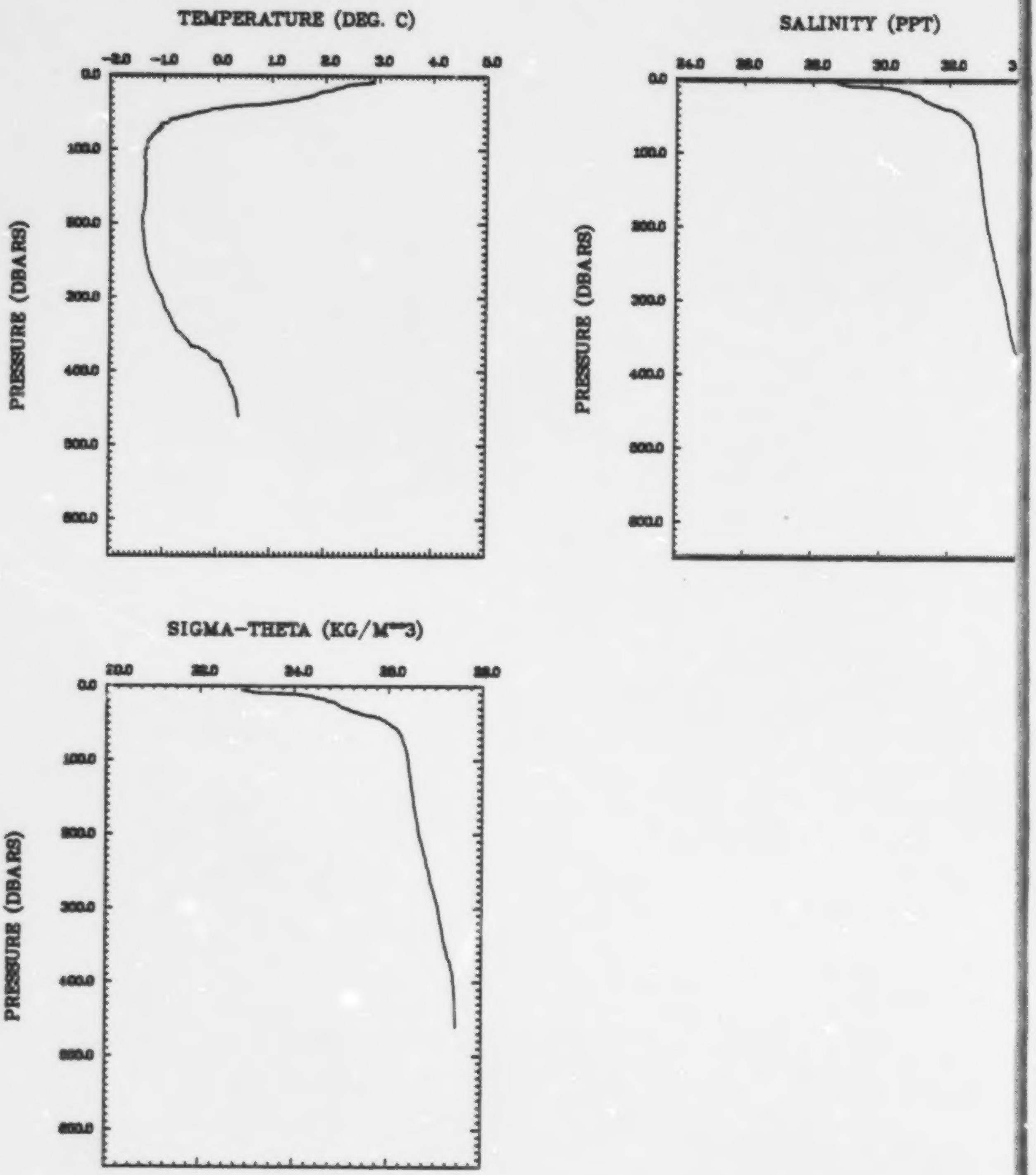


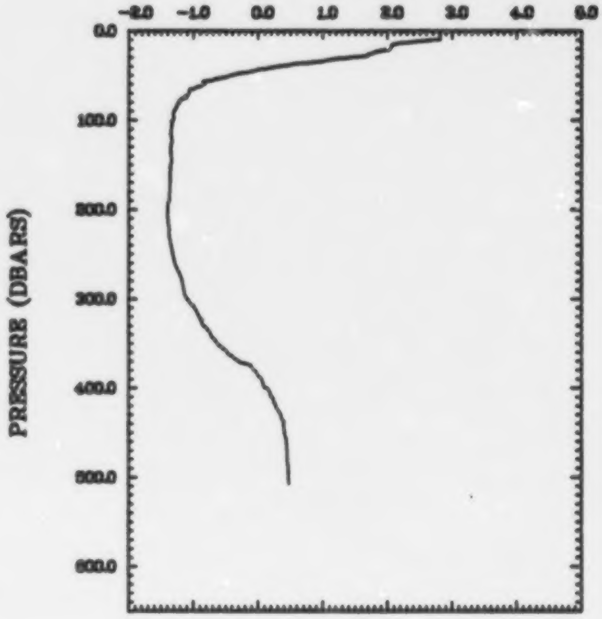
CA7.1 CTD 1 83.09.20
Lat. 71 46.2'N
Lon. 74 24.5'W

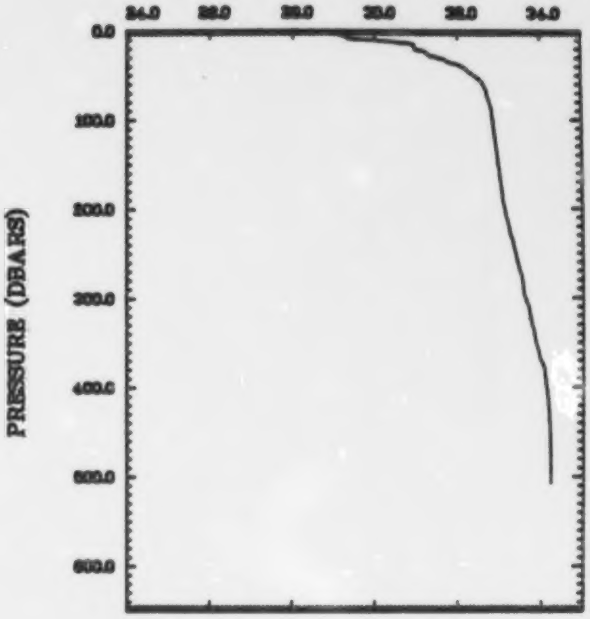


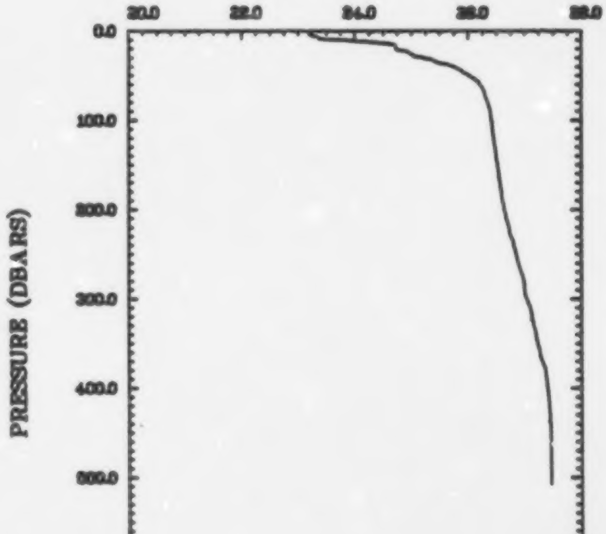
CA6.1 CTD 2 83.09.20
Lat. 71 43.2'N
Lon. 74 36.5'W



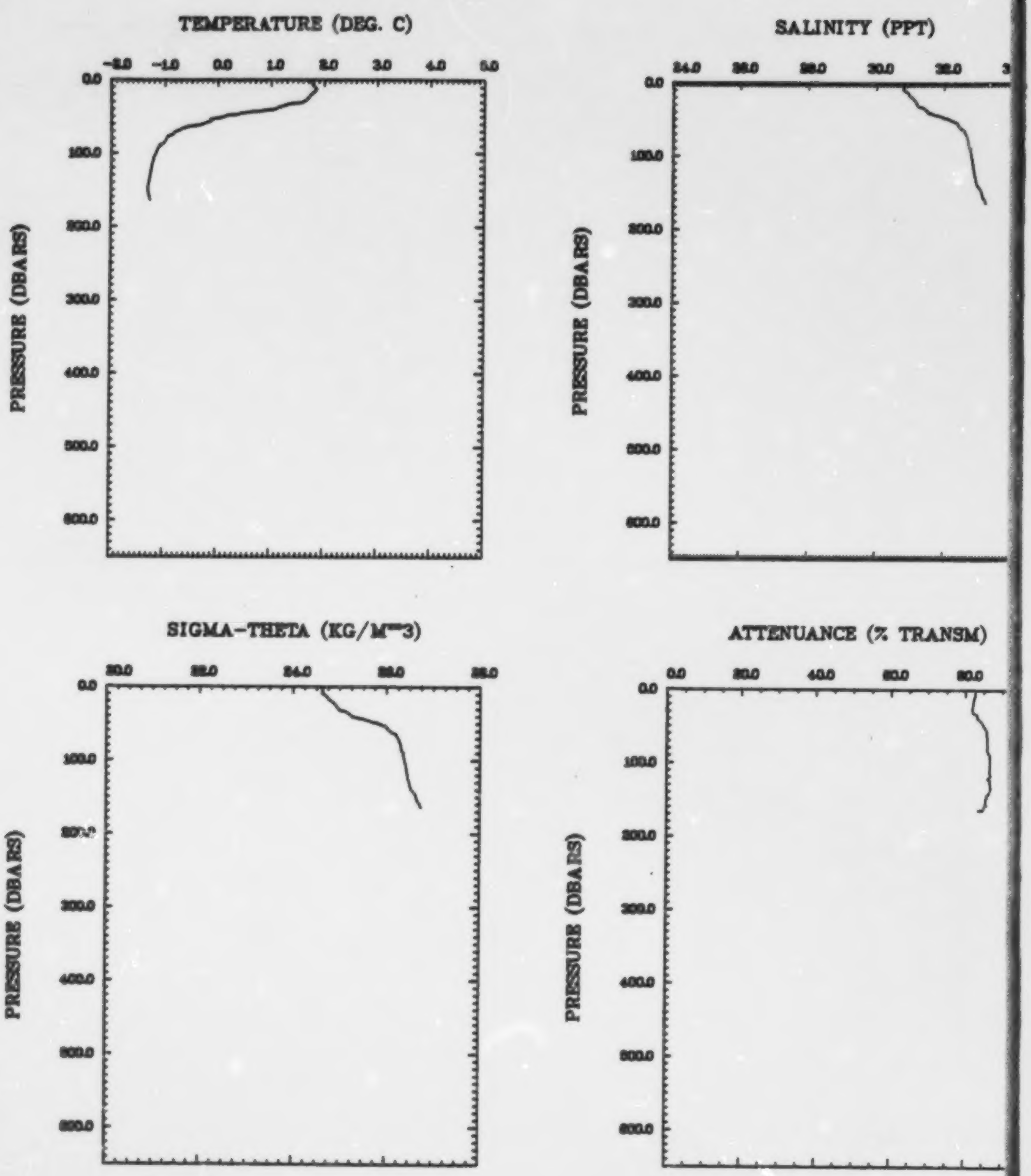
CA4.2 CTD 3 83.09.21
Lat. 71 27.4'N
Lon. 74 49.5'W


TEMPERATURE (DEG. C)


SALINITY (PPT)


SIGMA-THETA (KG/M**3)

CA4.1 CTD 4 93.09.21
Lat. 71 27.5'N
Lon. 74 45.0'W



TEMPERATURE (DEG. C)

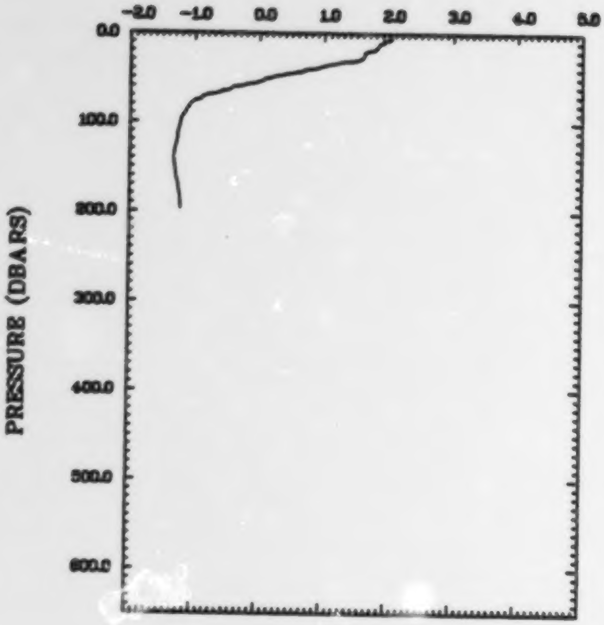
SALINITY (PPT)

SIGMA-THETA (KG/M**3)

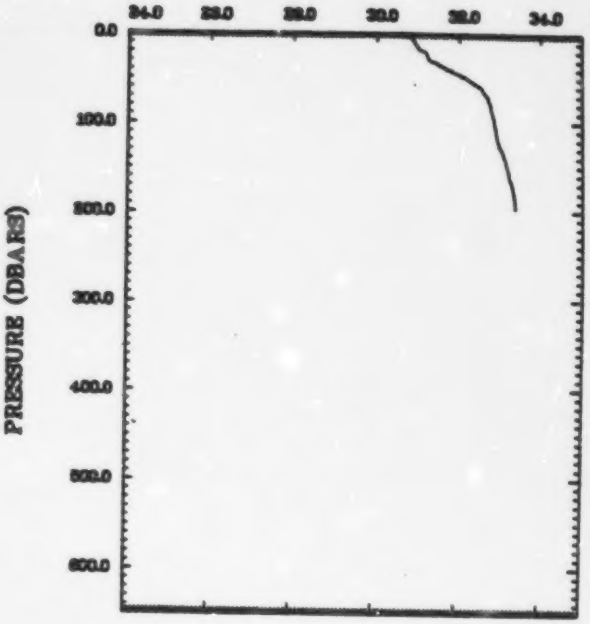
ATTENUANCE (% TRANSM)

CA1.0 CTD 5 83.09.22
Lat. 71 11.8'N
Lon. 75 2.0'W

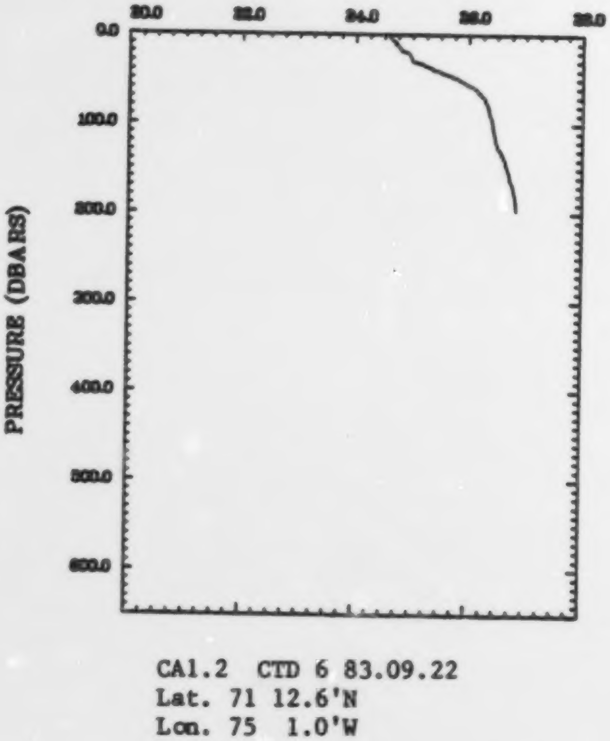
TEMPERATURE (DEG. C)



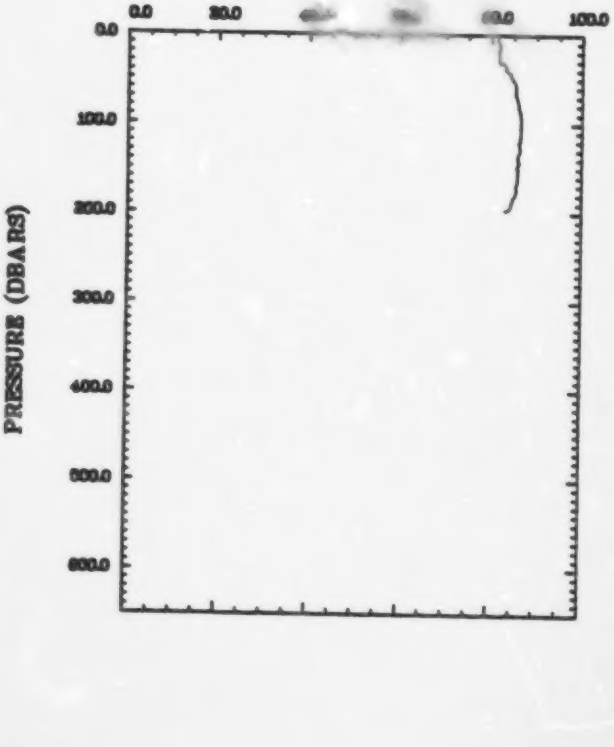
SALINITY (PPT)



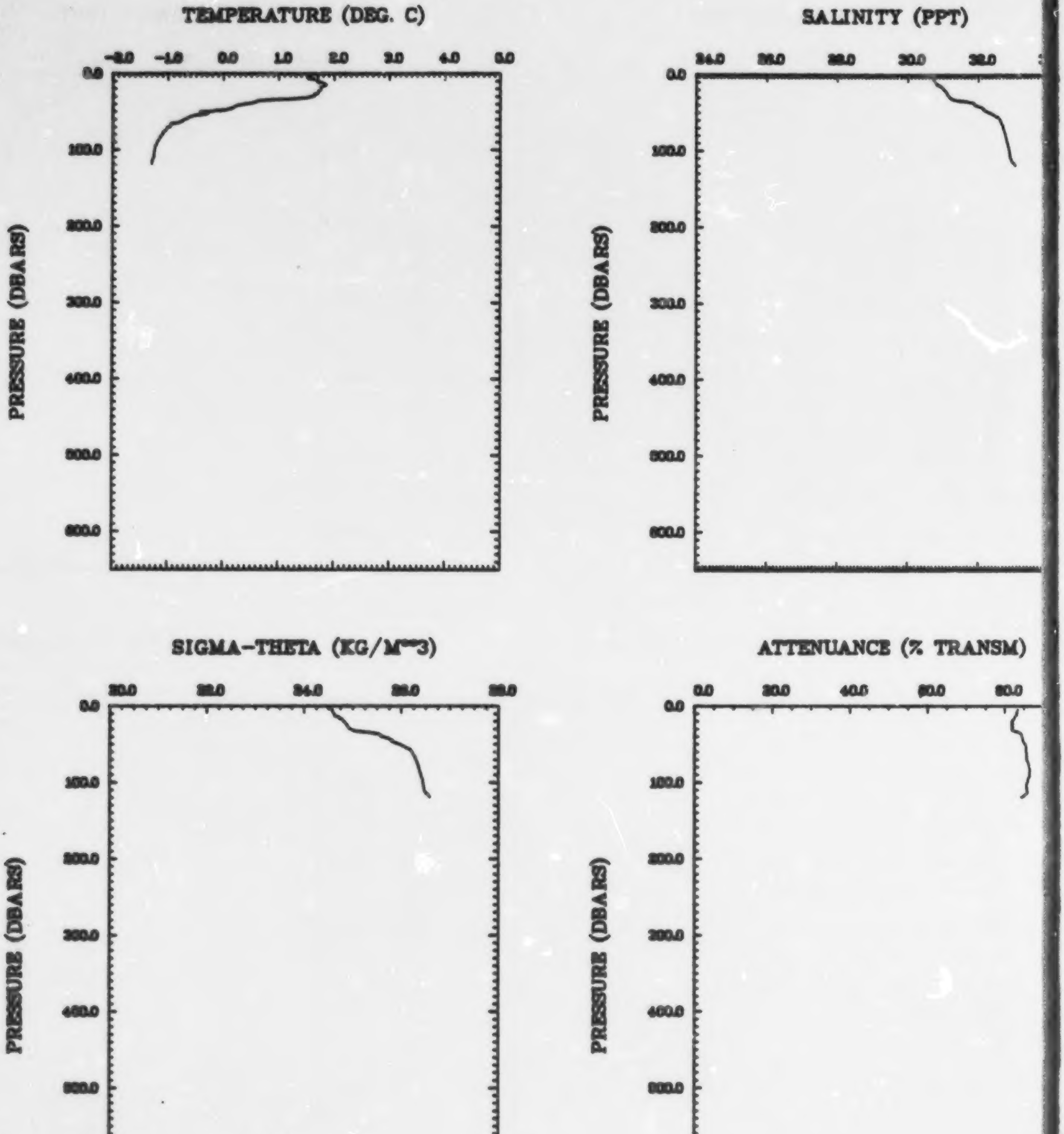
SIGMA-THETA (KG/M**3)



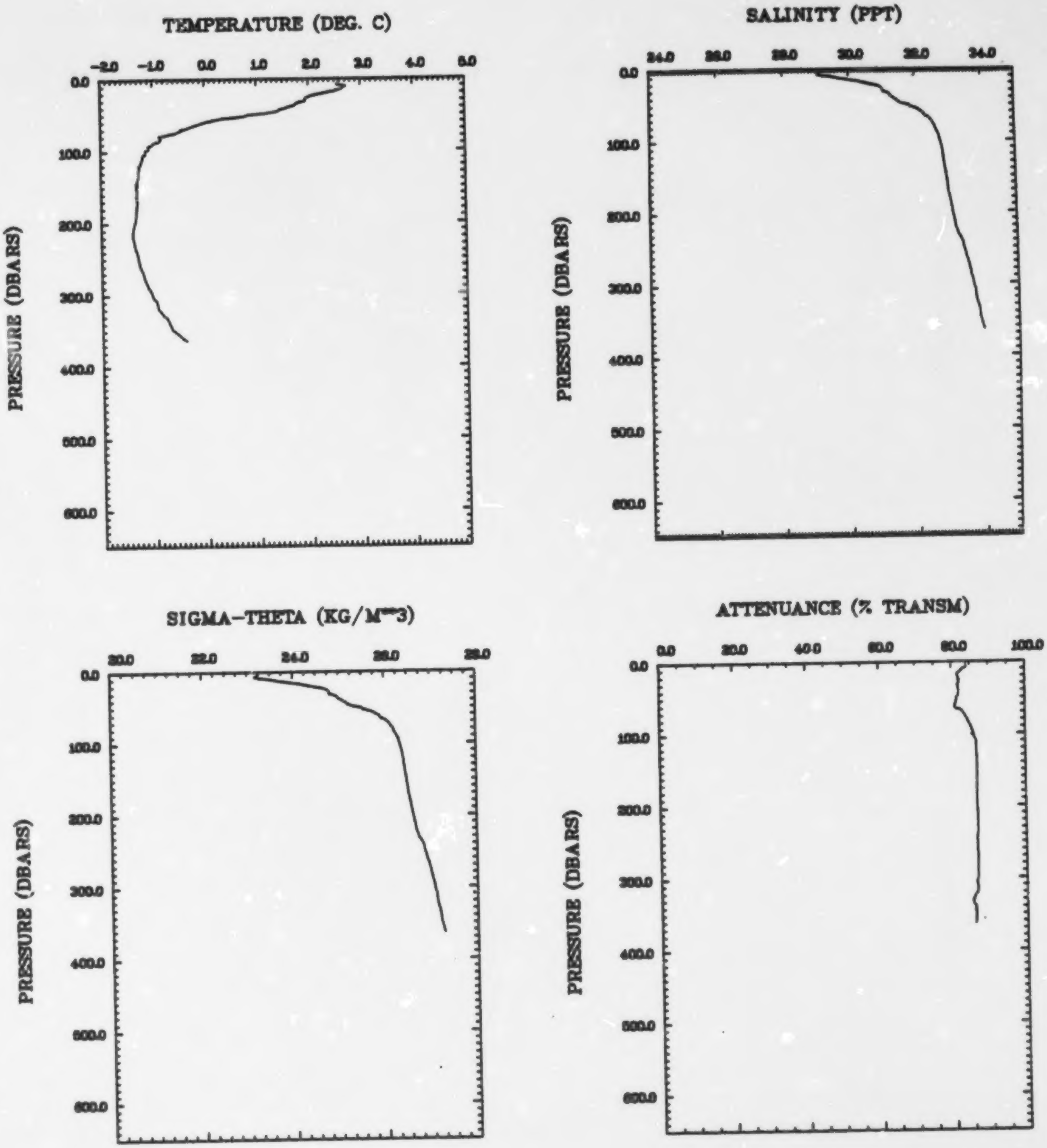
ATTENUANCE (% TRANSM)



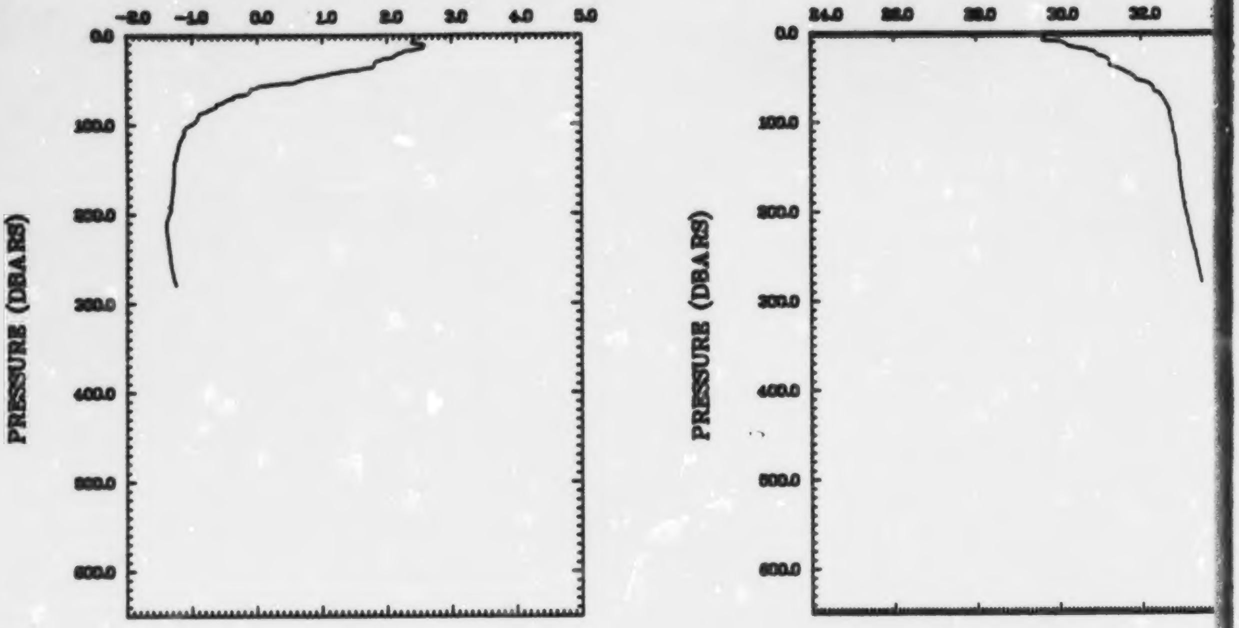
CA1.2 CTD 6 83.09.22
Lat. 71 12.6'N
Lon. 75 1.0'W



CA0.2 CTD 7 83.09.22
Lat. 71 11.5'N
Lon. 75 2.5'W

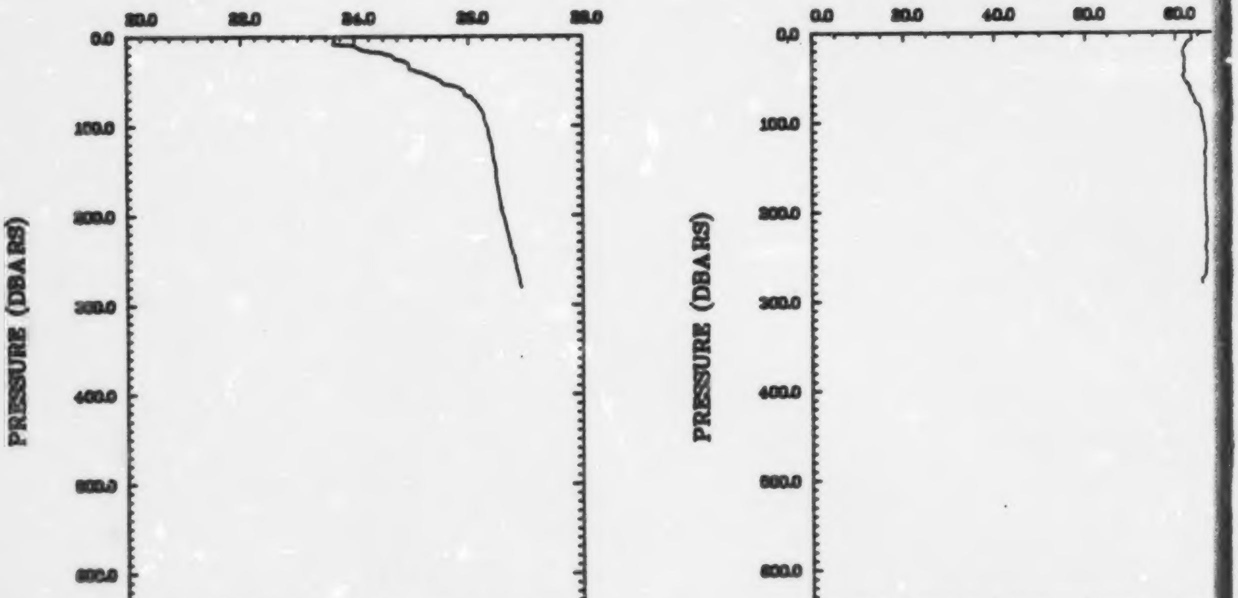


CA3.0 CTD 8 83.09.22
Lat. 71 23.5'N
Lon. 74 38.0'W



TEMPERATURE (DEG. C)

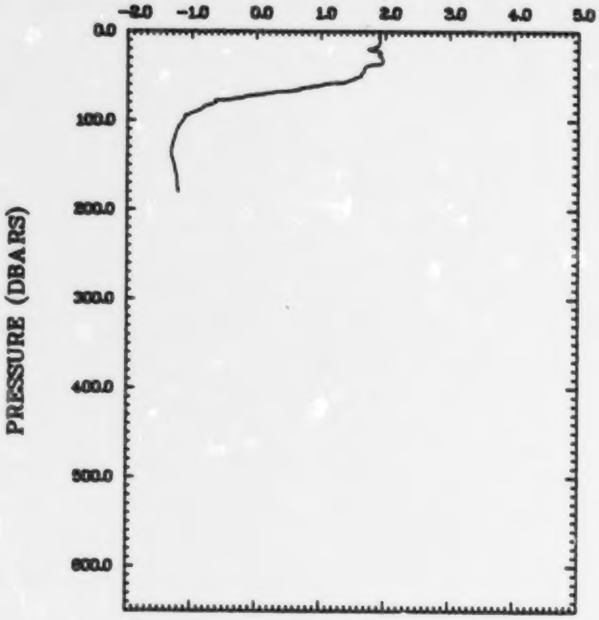
SALINITY (PPT)



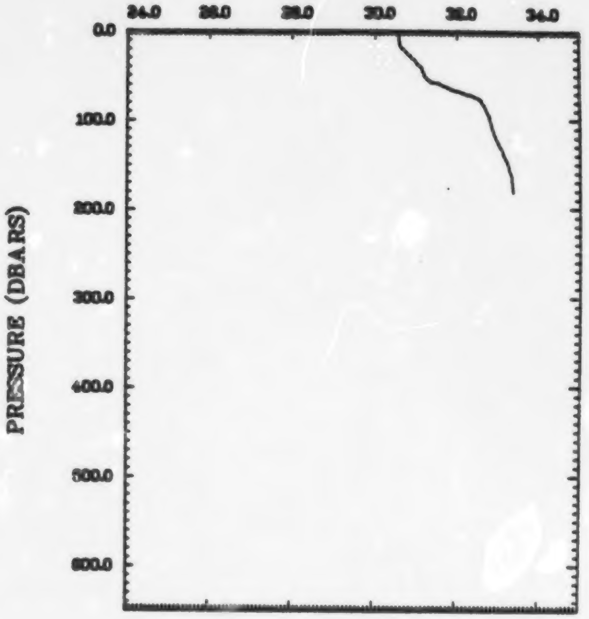
SIGMA-THETA (KG/M**3)

ATTENUANCE (% TRANSM)

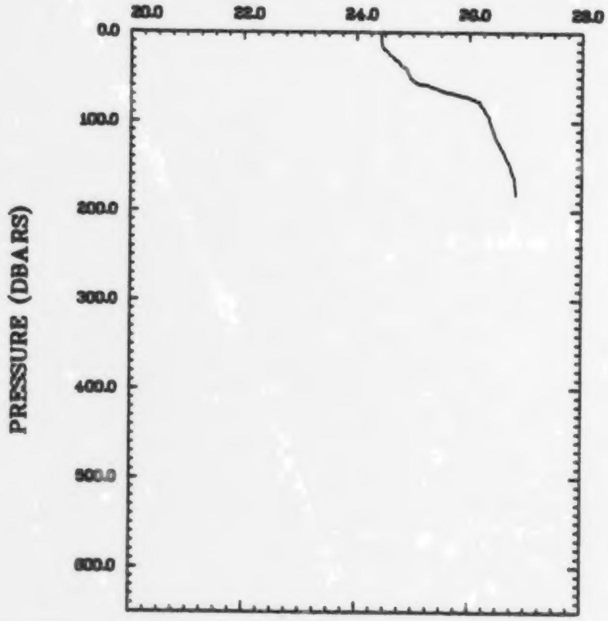
CA2.2 CTD 9 83.09.22
Lat. 71 19.4'N
Lon. 74 46.2'W



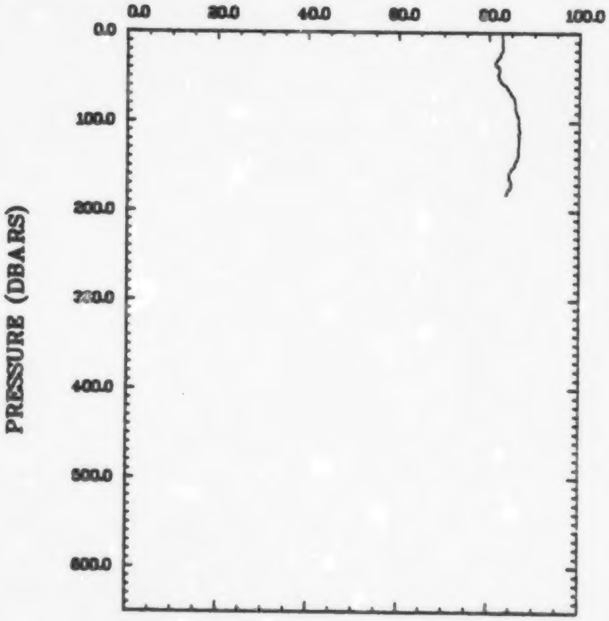
TEMPERATURE (DEG. C)



SALINITY (PPT)

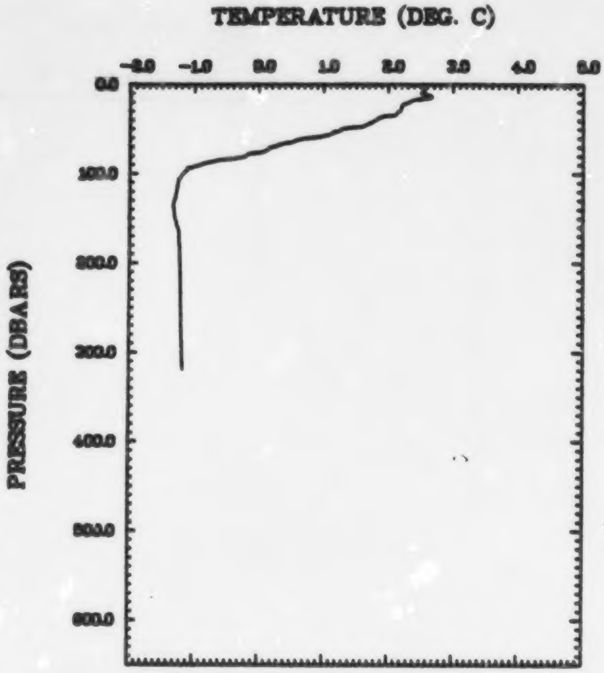


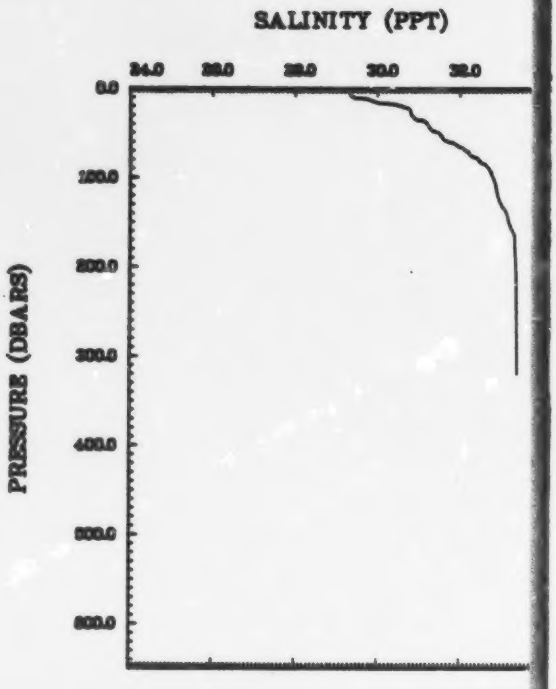
SIGMA-THETA (KG/M**3)

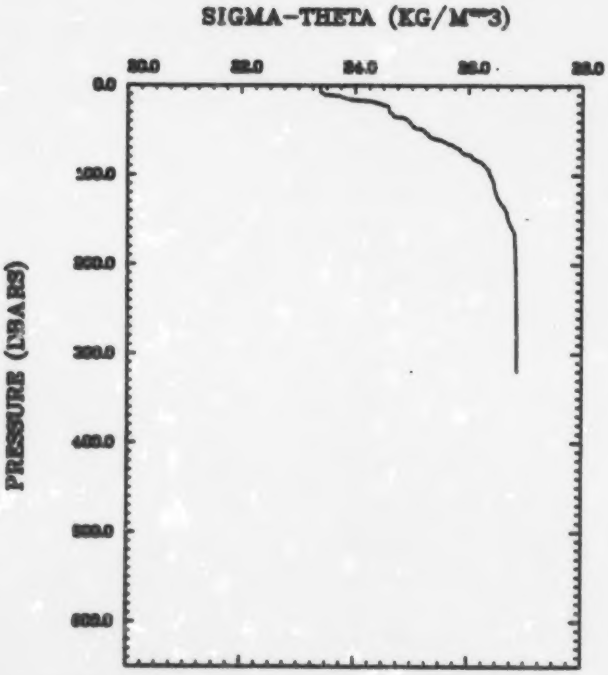


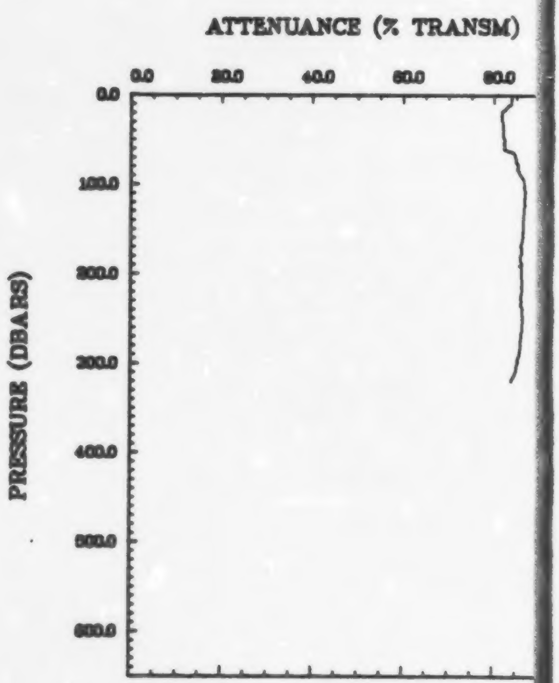
ATTENUANCE (% TRANSM)

CA1.1 CTD 10 83.09.22
Lat. 71 12.7'N
Lon. 74 59.0'W

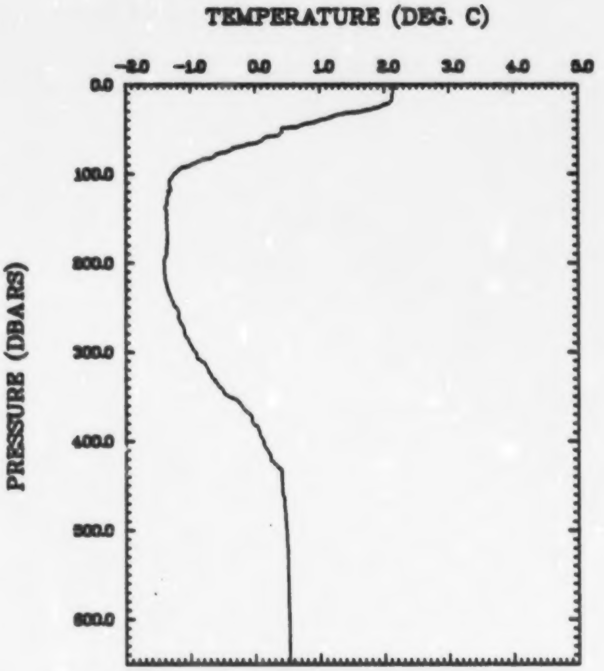


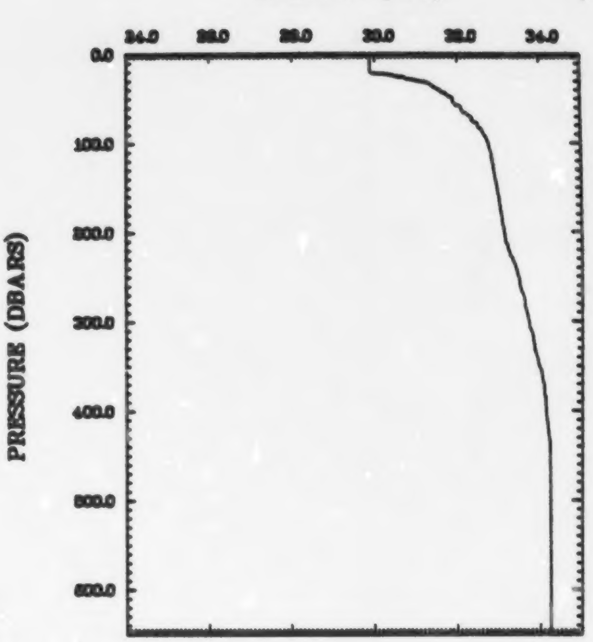


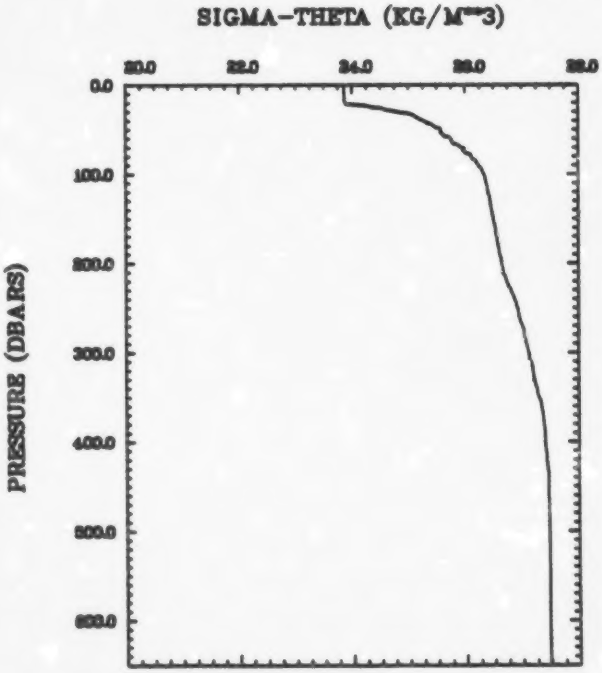


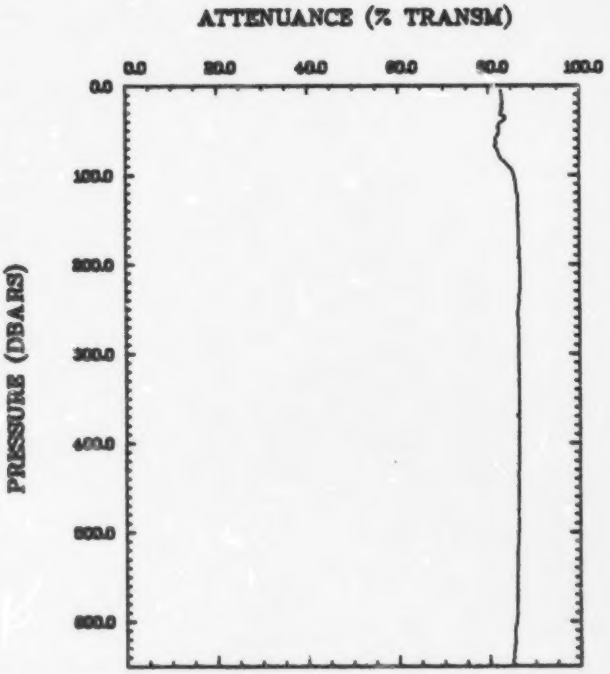


CA2 CTD 11 83.09.23
Lat. 71 16.4'N
Lon. 74 51.5'W

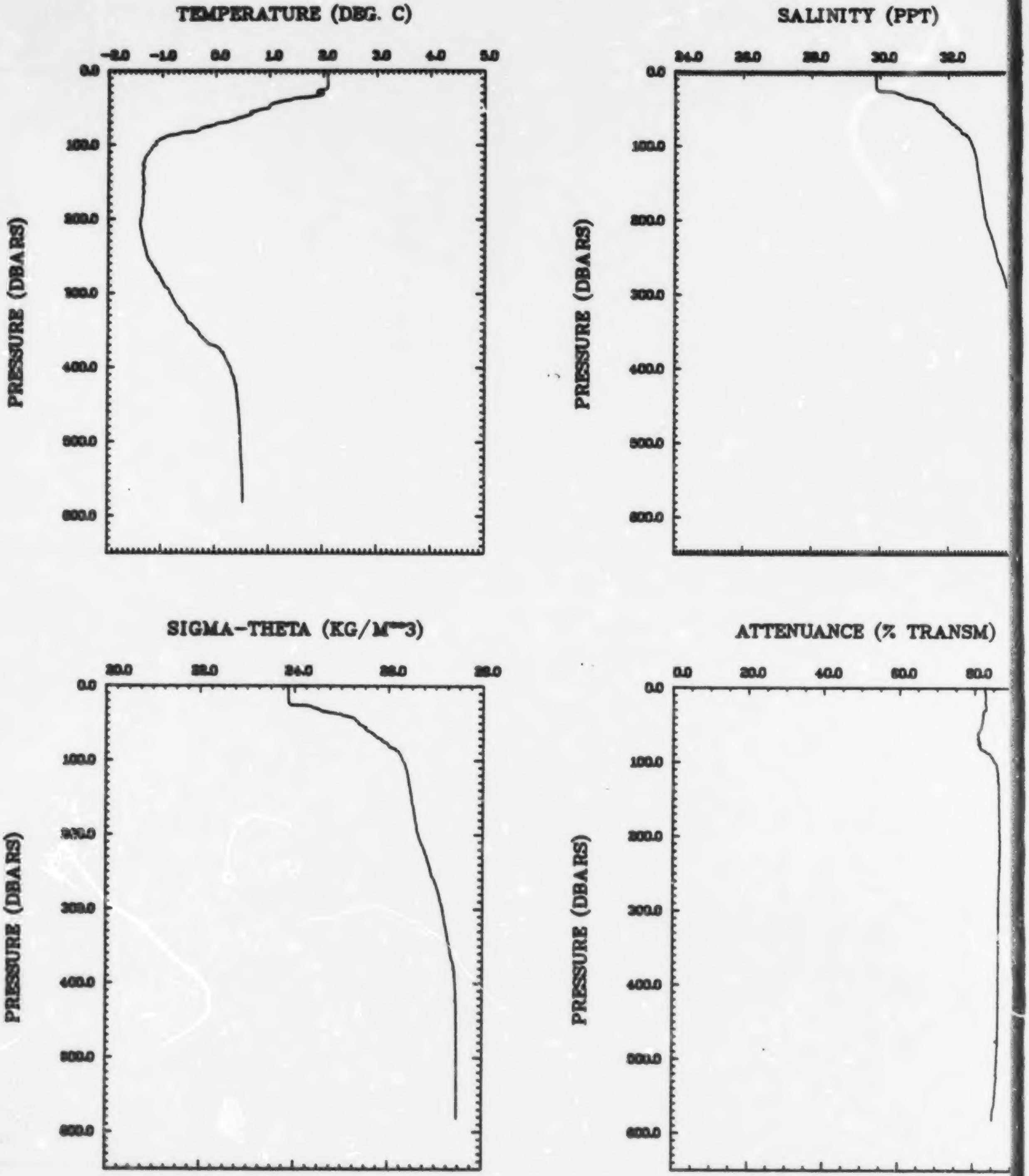




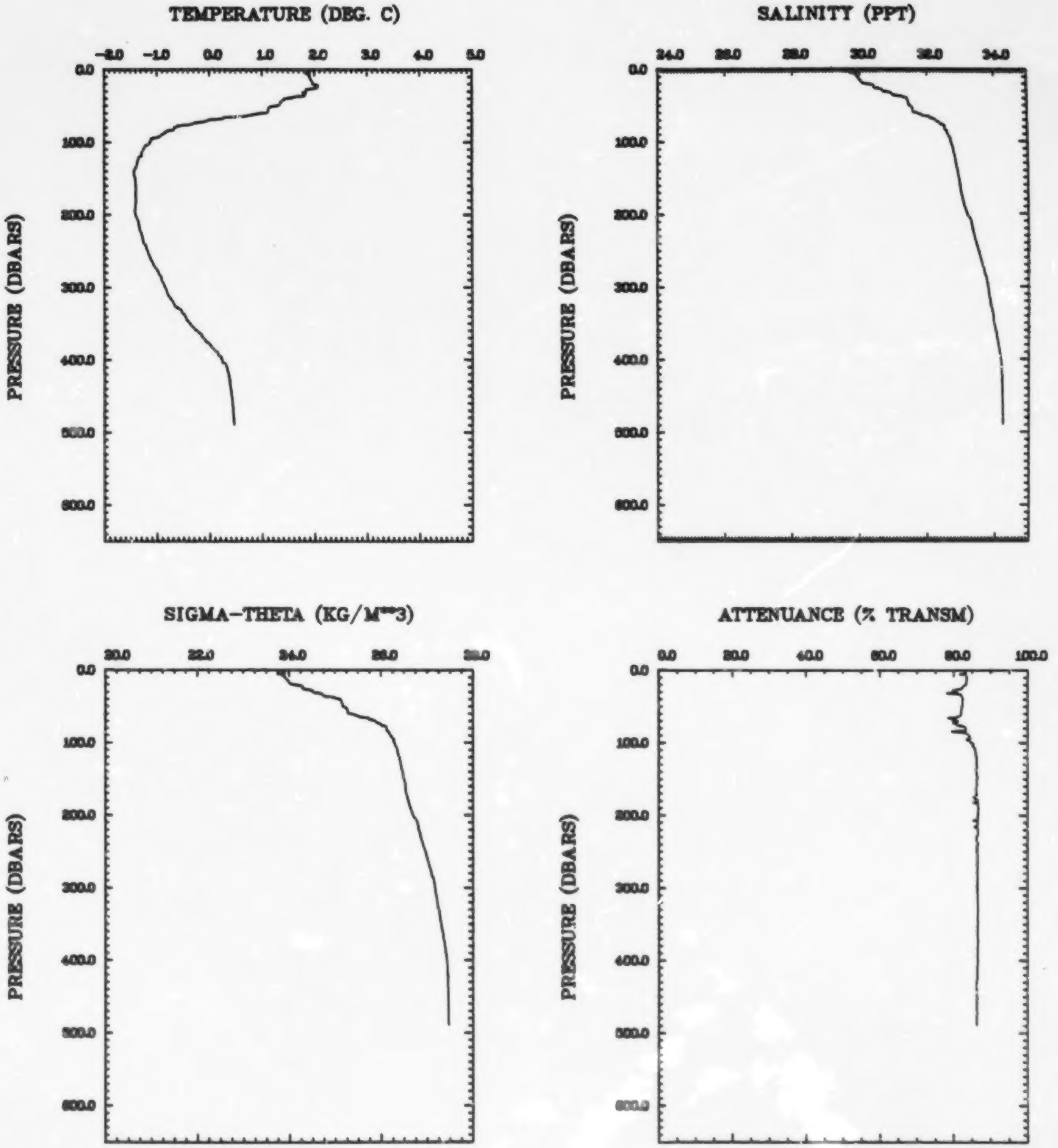




CA6 CTD 12 83.09.23
Lat. 71 35.5'N
Lon. 74 38.4'W

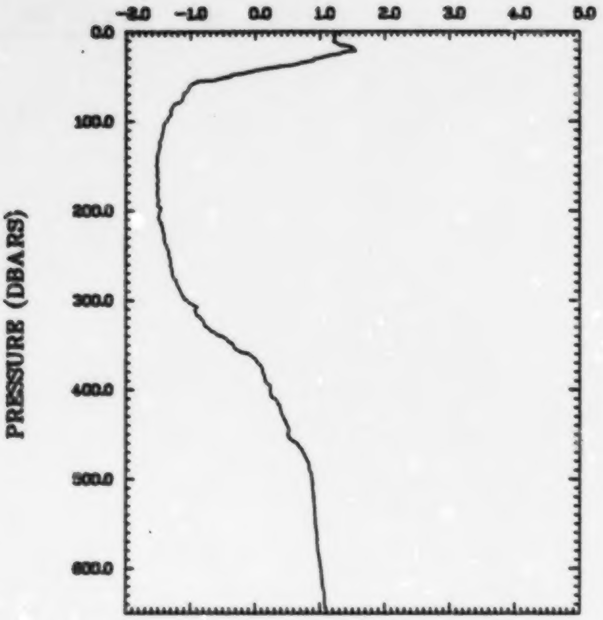


CA5 CTD13 83.09.23
Lat. 71 33.3'N
Lon. 74 44.5'W

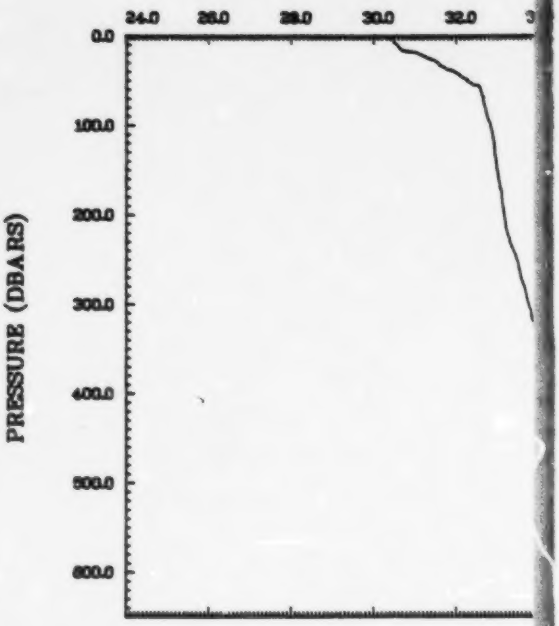


CA5.1 CTD 14 83.09.24
Lat. 71 34.8'N
Lon. 74 37.0'W

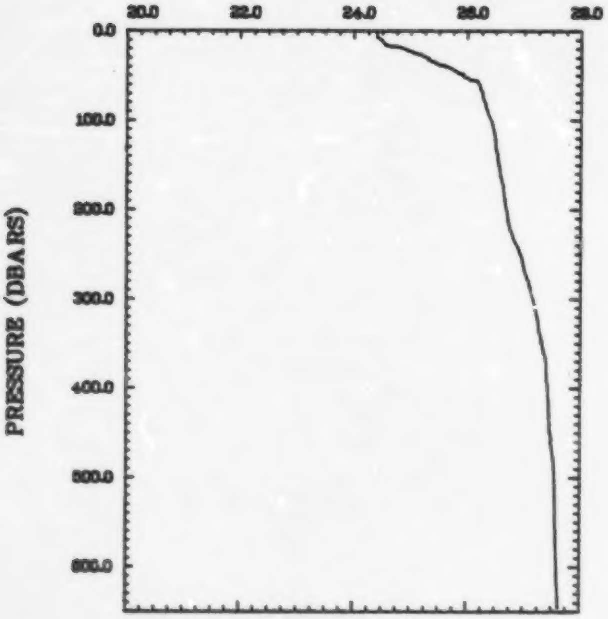
TEMPERATURE (DEG. C)



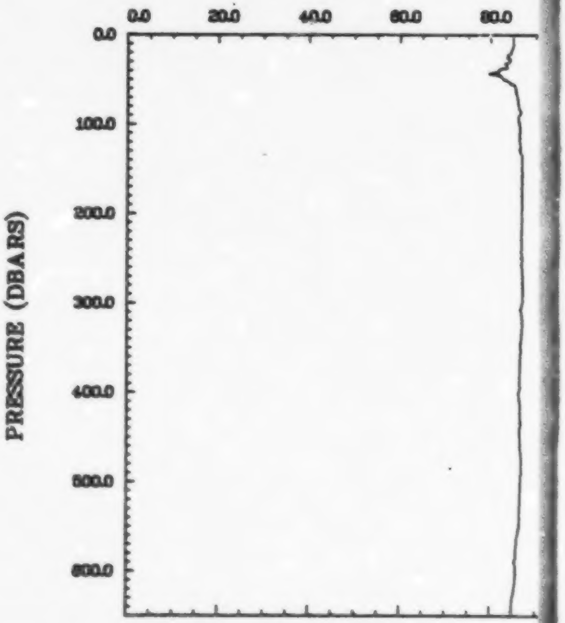
SALINITY (PPT)



SIGMA-THETA (KG/M**3)

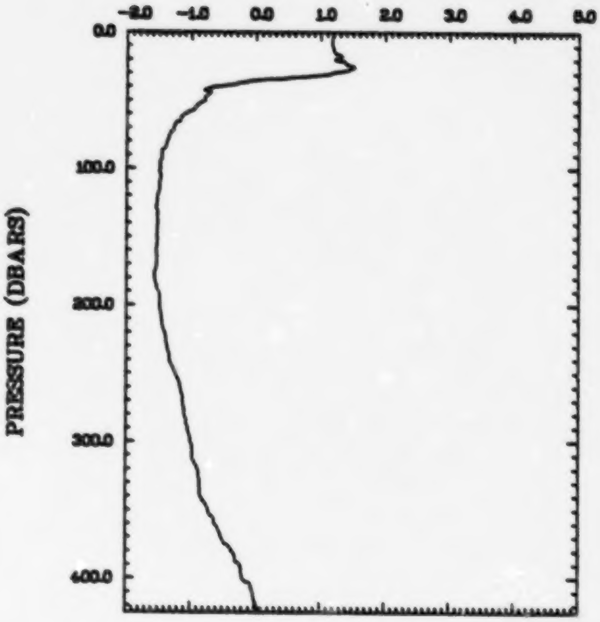


ATTENUANCE (% TRANSM)

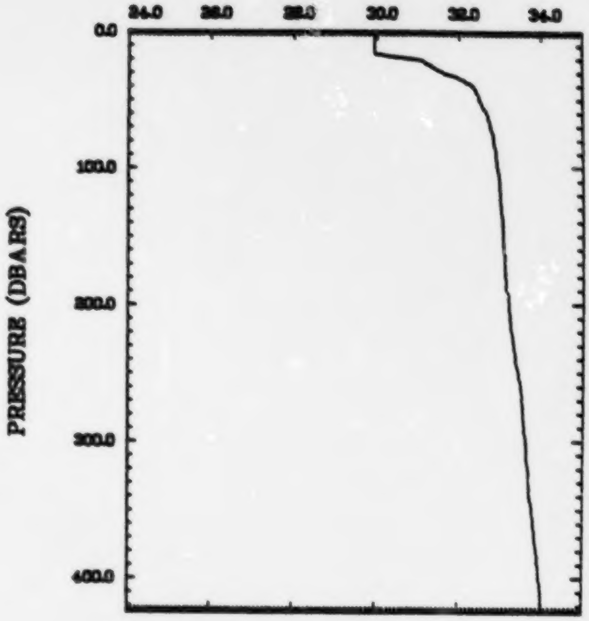


CA9 CTD 15 83.09.24
Lat. 71 49.0'N
Lon. 74 32.0'W

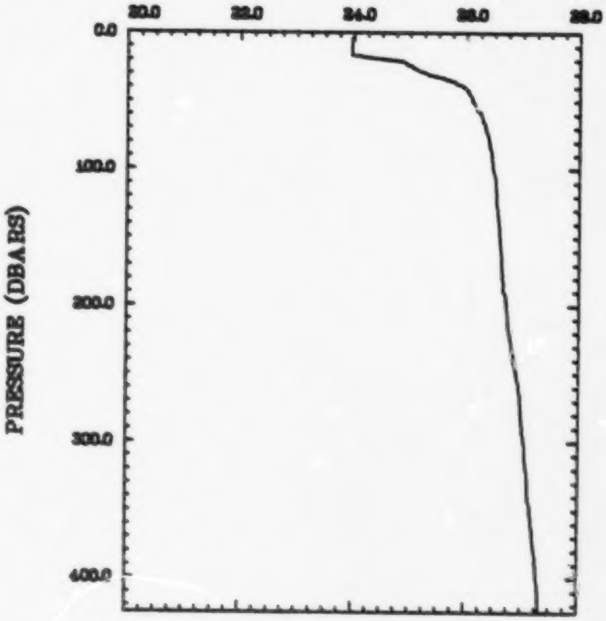
TEMPERATURE (DEG. C)



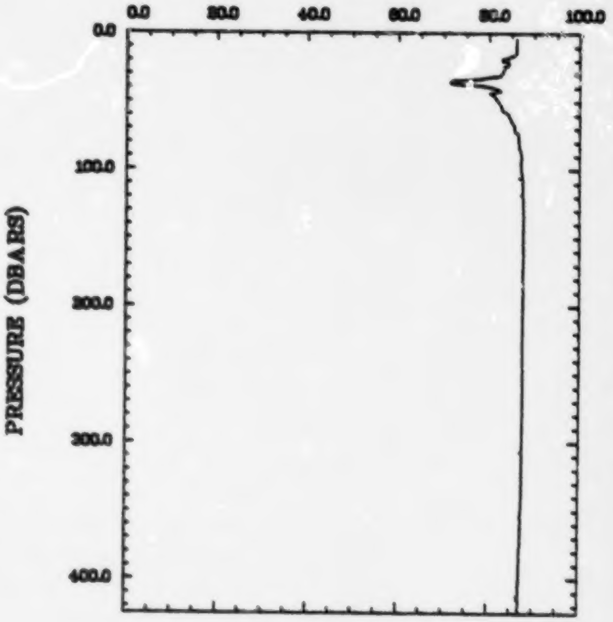
SALINITY (PPT)



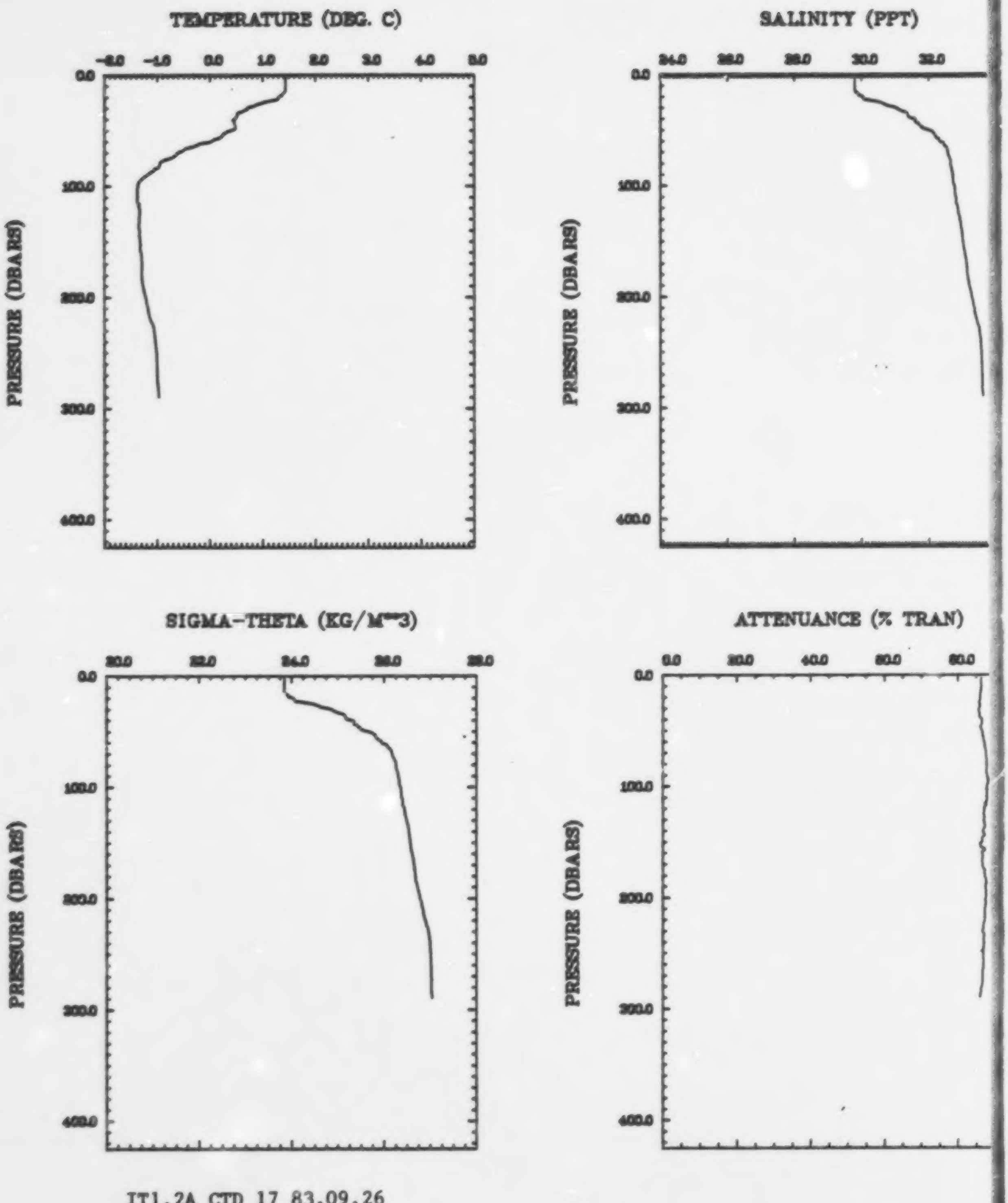
SIGMA-THETA (KG/M**3)



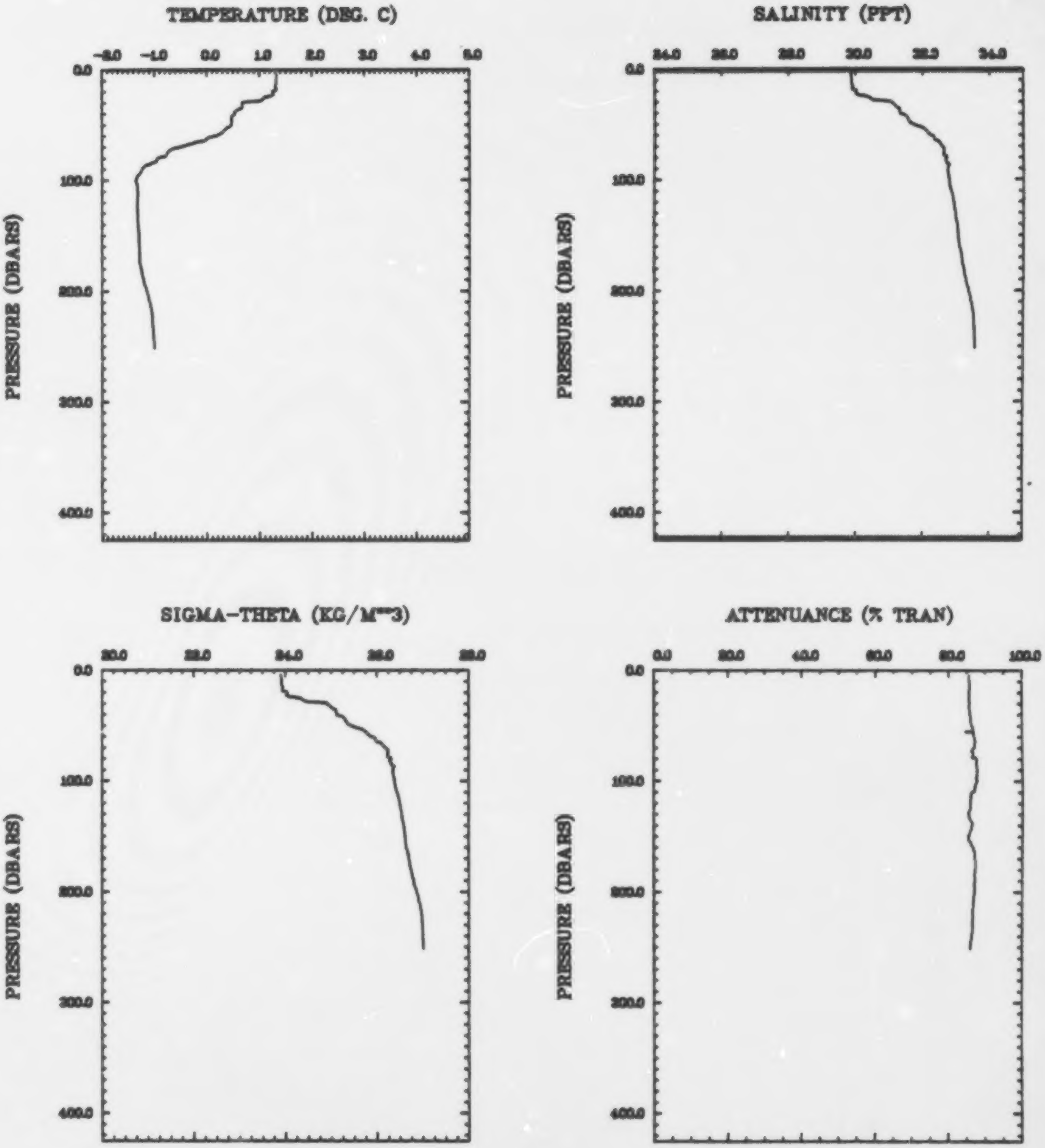
ATTENUANCE (% TRAN)



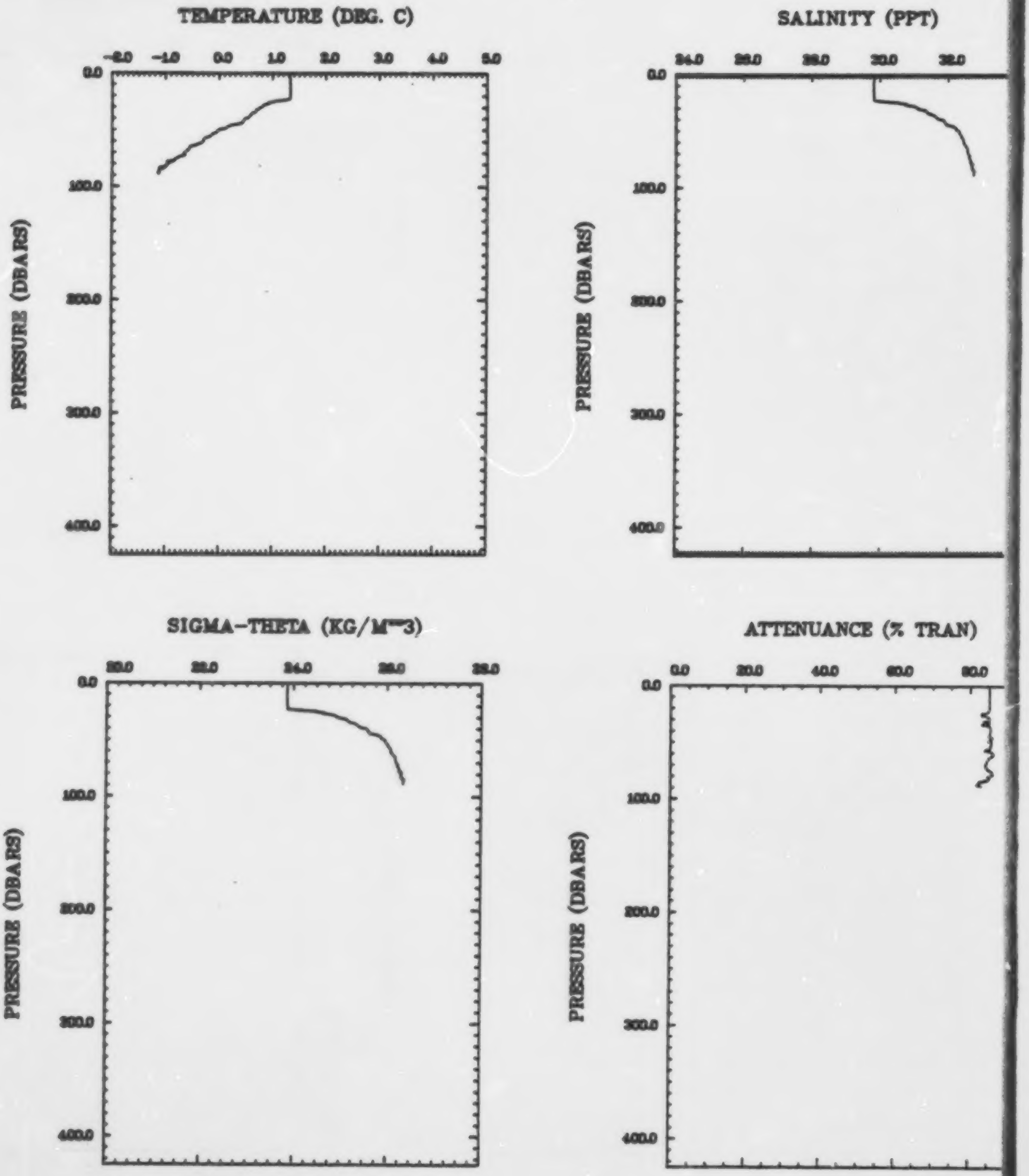
IT6 CTD 16 83.09.25
Lat. 68 52.7'N
Lon. 66 24.5'W



IT1.2A CTD 17 83.09.26
Lat. 69 20.8'N
Lon. 69 1.5'W

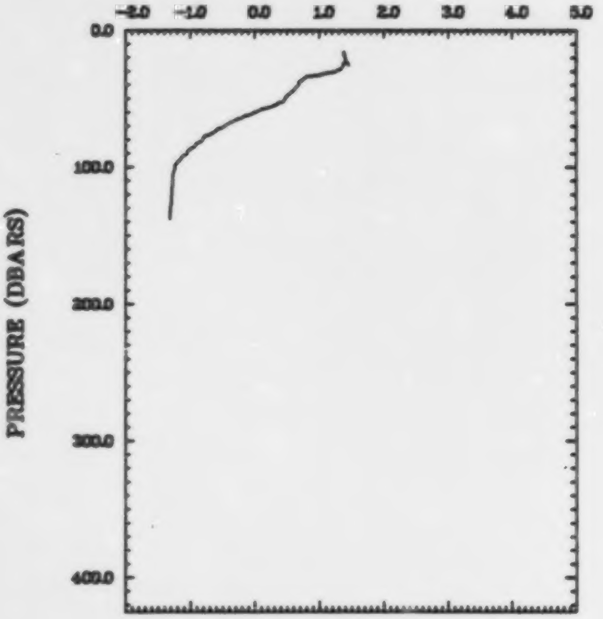


IT1.1 CTD 18 83.09.26
Lat. 69 20.0'N
Lon. 69 3.8'W

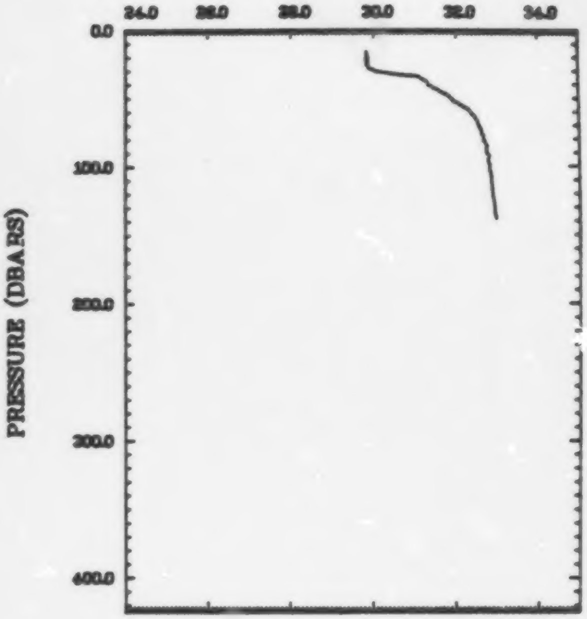


ITO.2 CTD 19 83.09.26
Lat. 69 16.4'N
Lon. 69 15.0'W

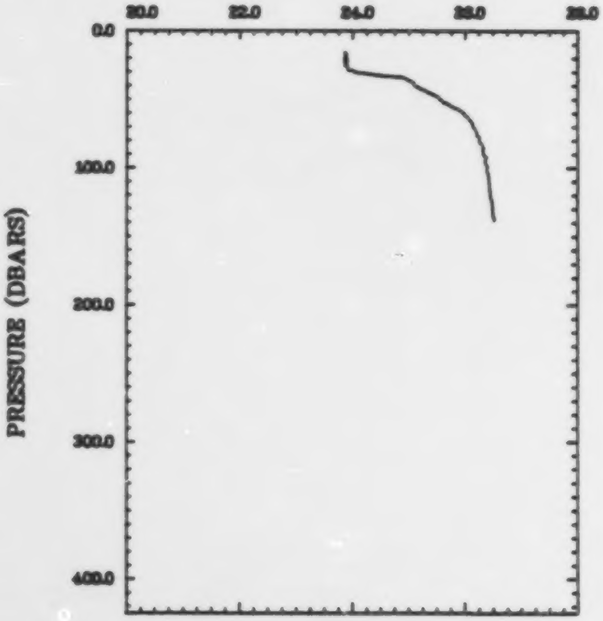
TEMPERATURE (DEG. C)



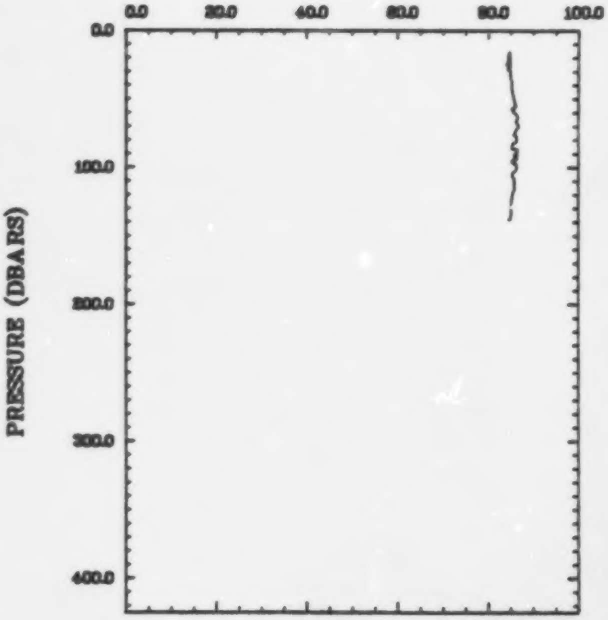
SALINITY (PPT)



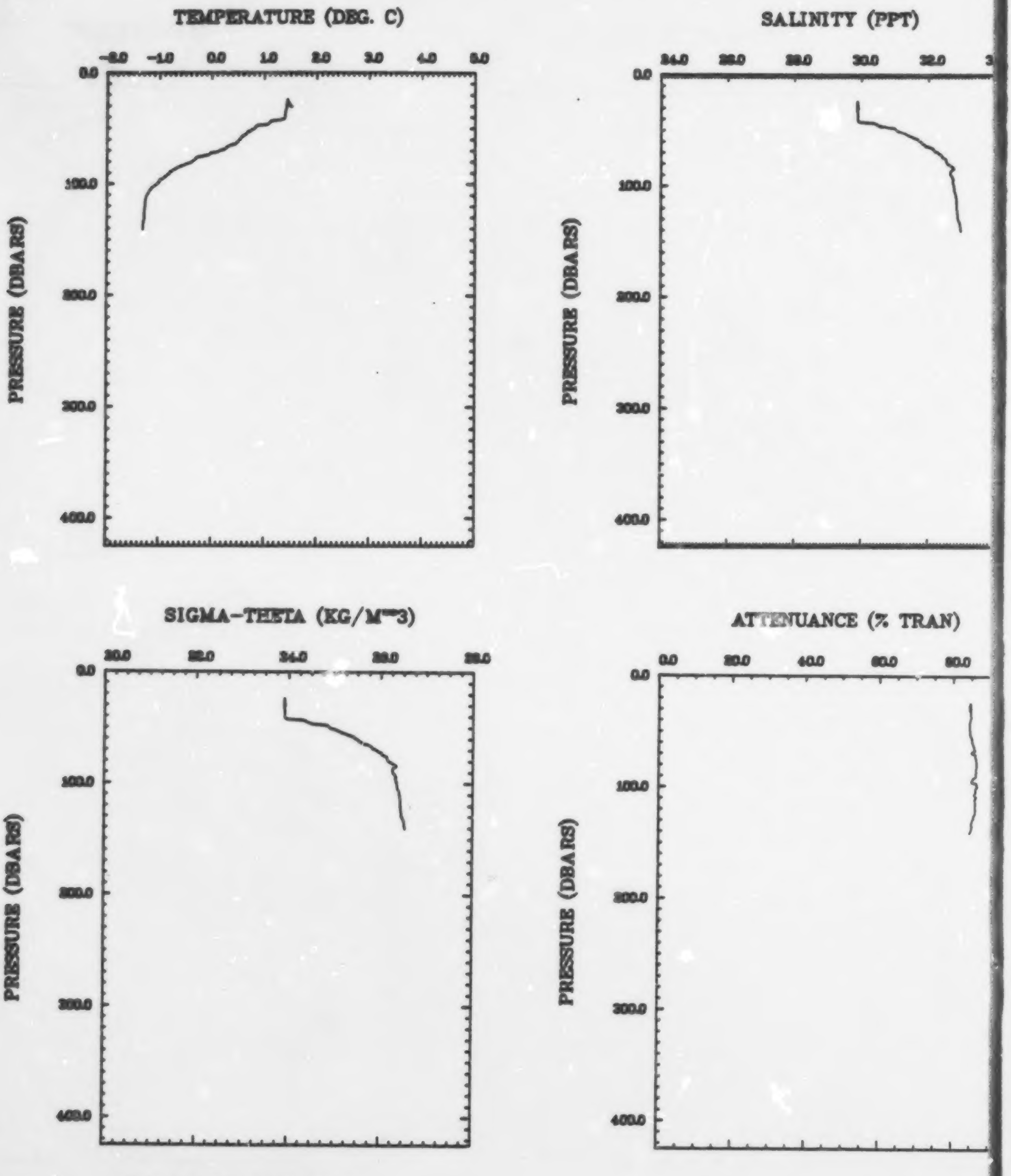
SIGMA-THETA (KG/M**3)



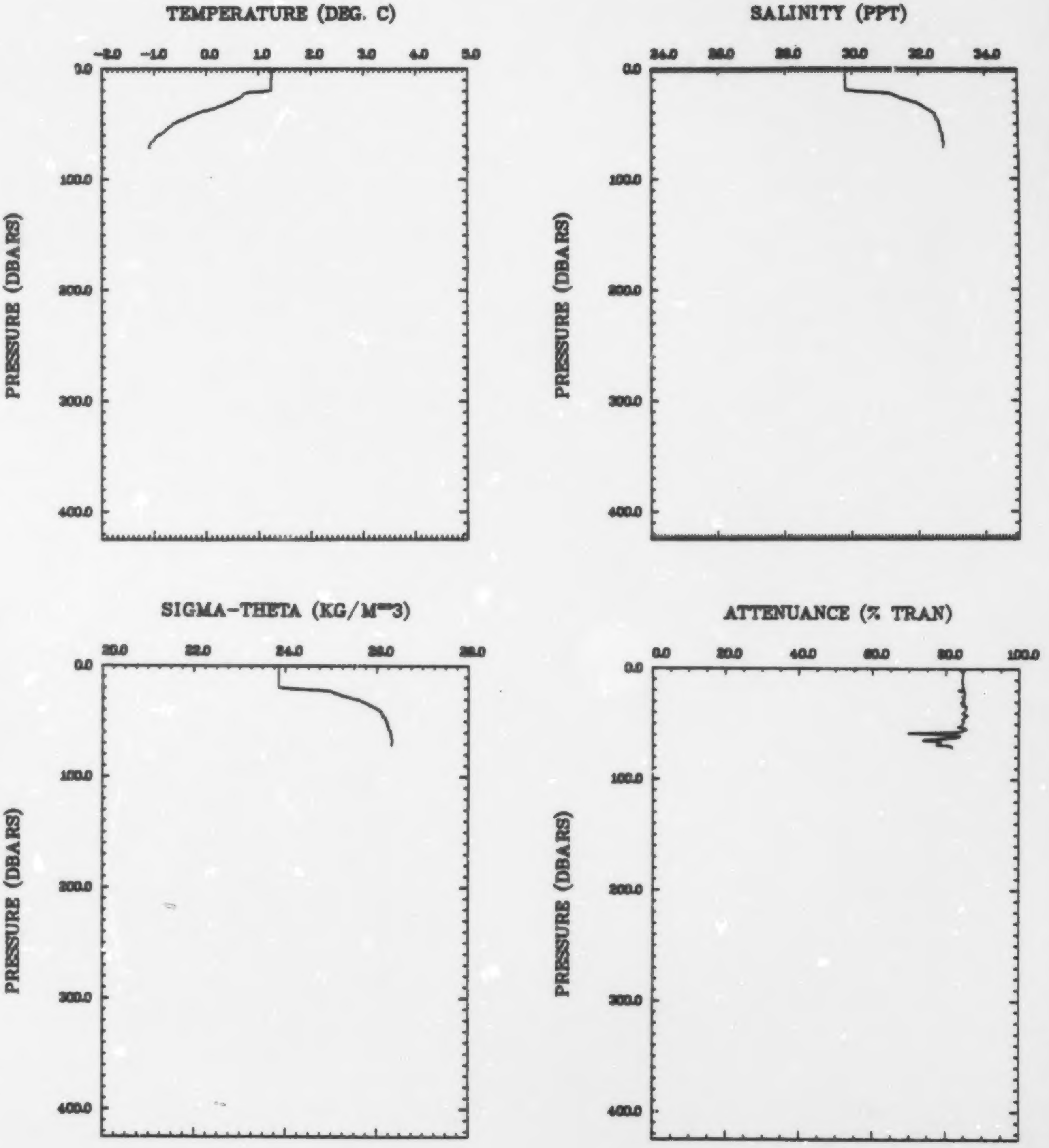
ATTENUANCE (% TRAN)



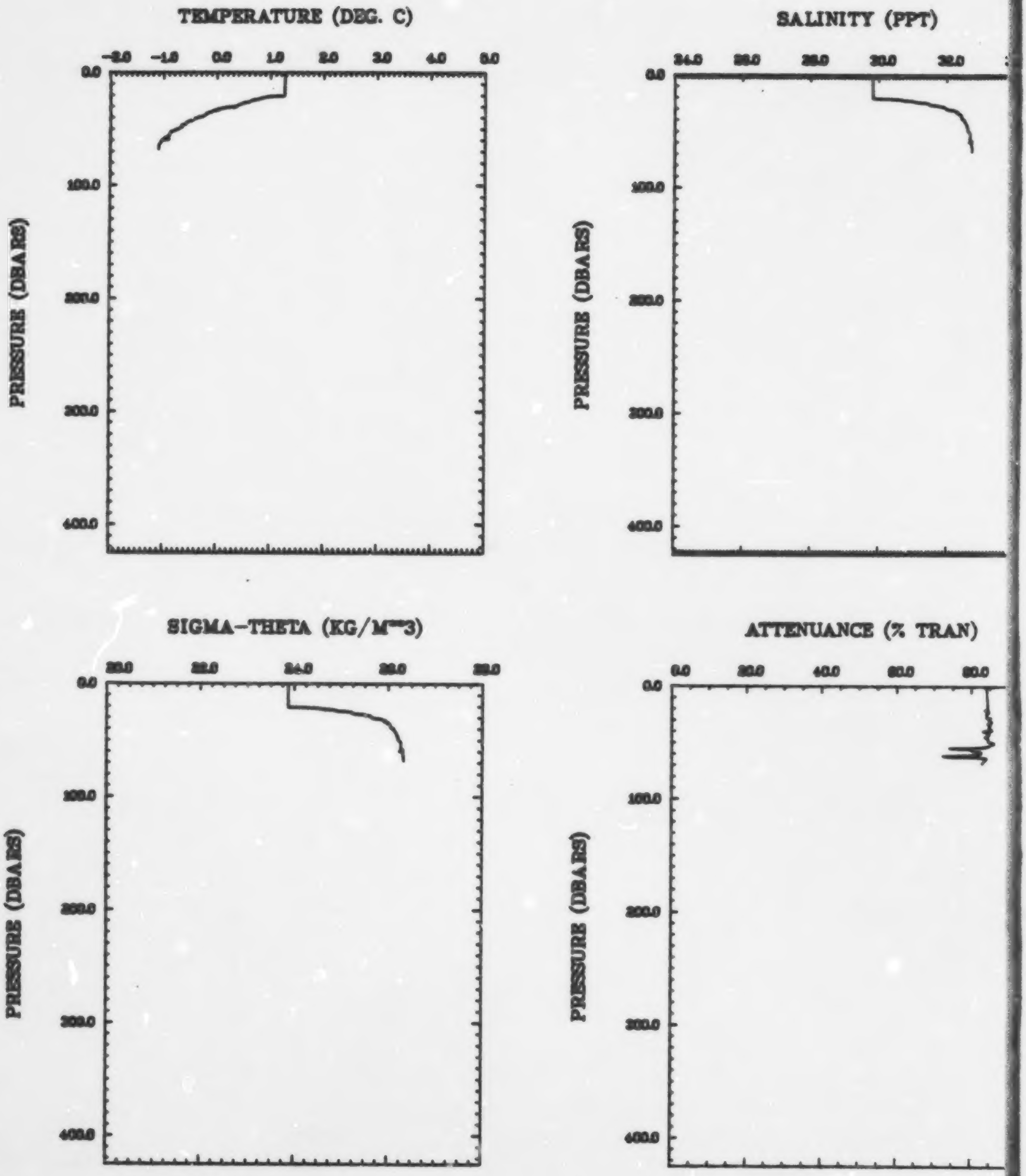
ITO.3 CTD 20 83.09.26
Lat. 69 17.5'N
Lon. 69 11.0'W



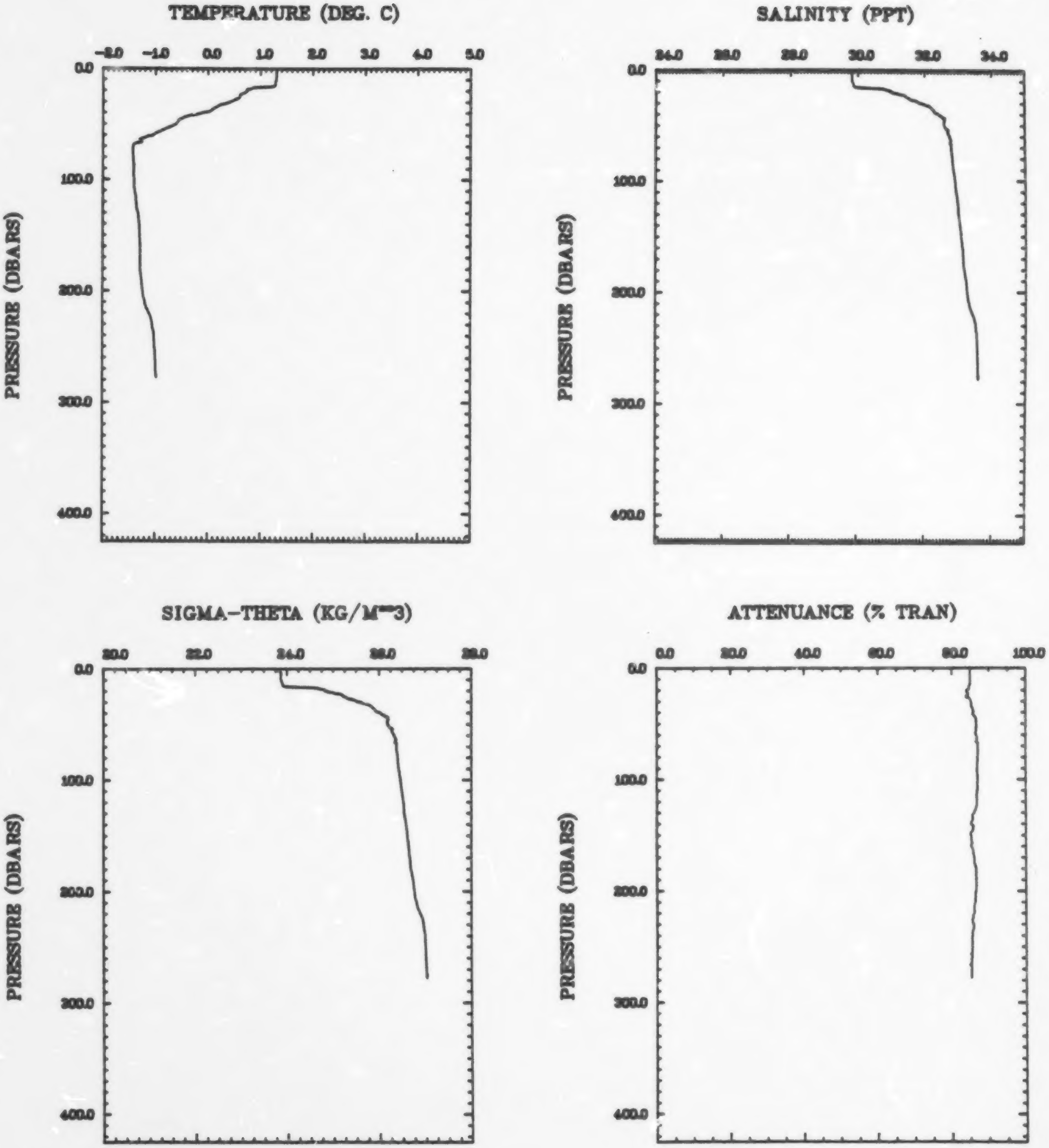
ITO.4 CTD 21 83.09.26
Lat. 69 17.9'N
Lon. 69 12.1'W



ITO.1B CTD 23 83.09.27
Lat. 69 16.4'N
Lon. 69 15.1'W



ITO.1D CTD 25 83.09.27
Lat. 69 16.4'N
Lon. 69 15.1'W



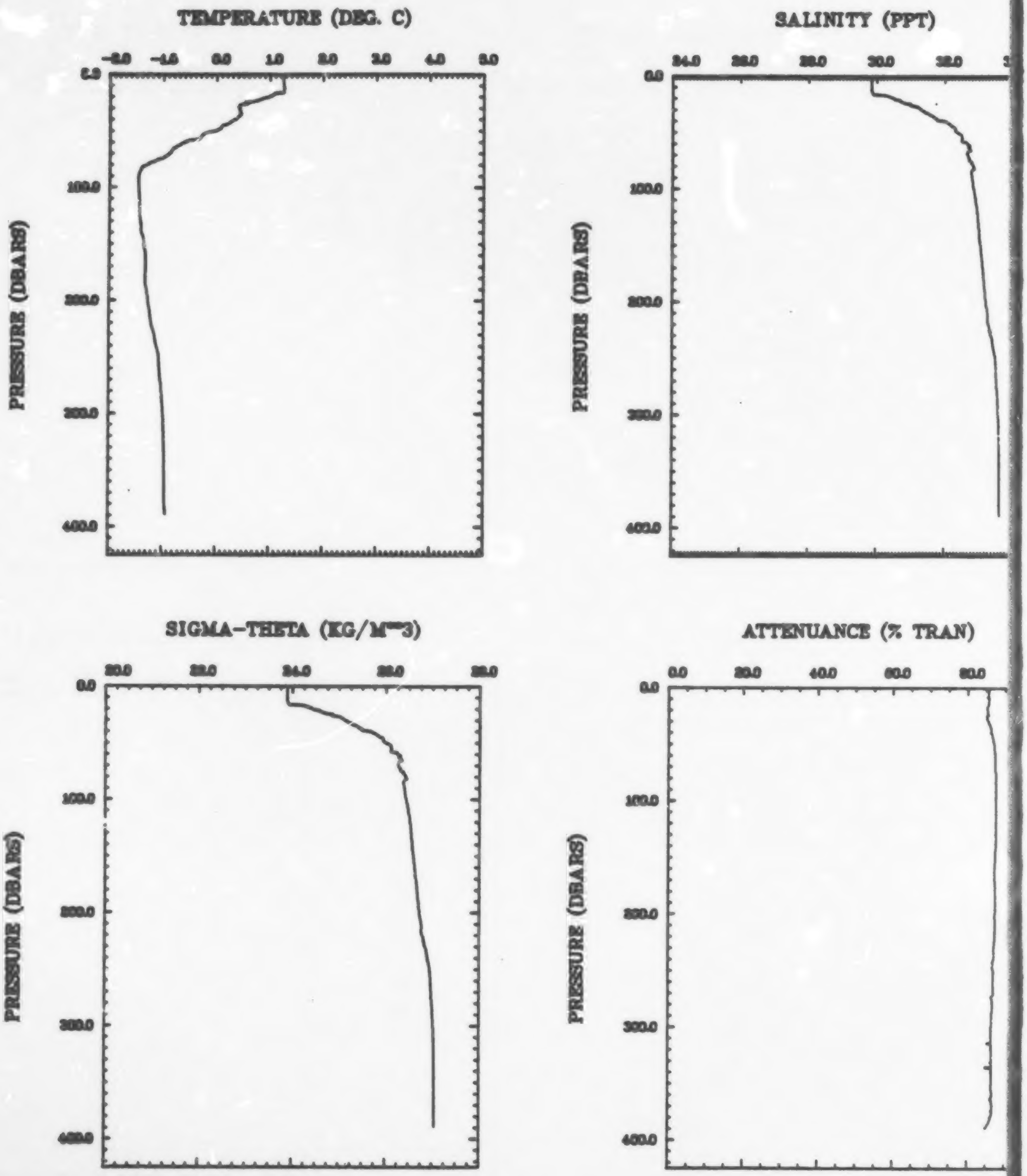
TEMPERATURE (DEG. C)

SALINITY (PPT)

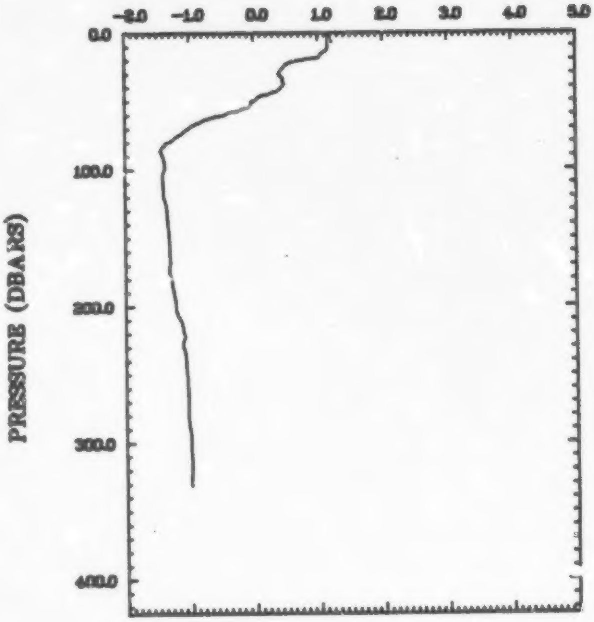
SIGMA-THETA (KG/M**3)

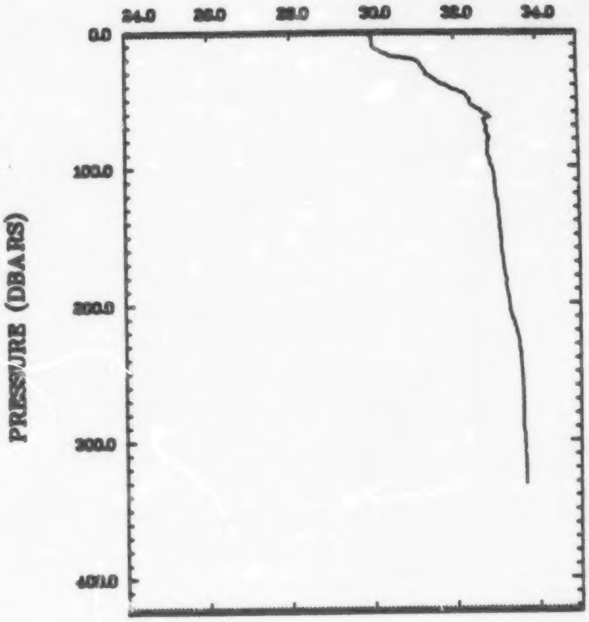
ATTENUANCE (% TRAN)

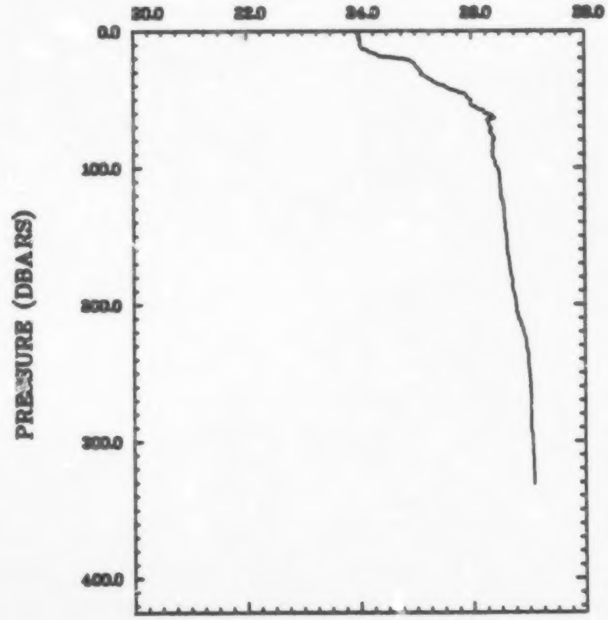
IT1.2B CTD 26 83.09.27
Lat. 69 1.5'N
Lon. 69 20.7'W

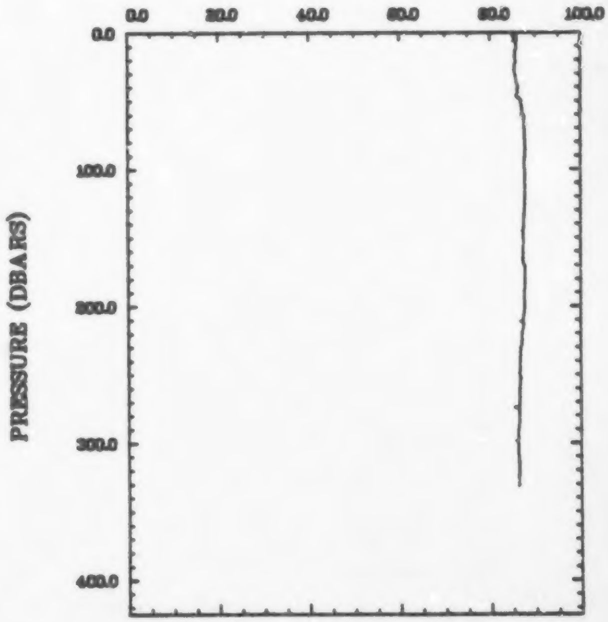


IT2.2 CTD 27 83.09.27
Lat. 69 19.3'N
Lon. 68 54.0'W

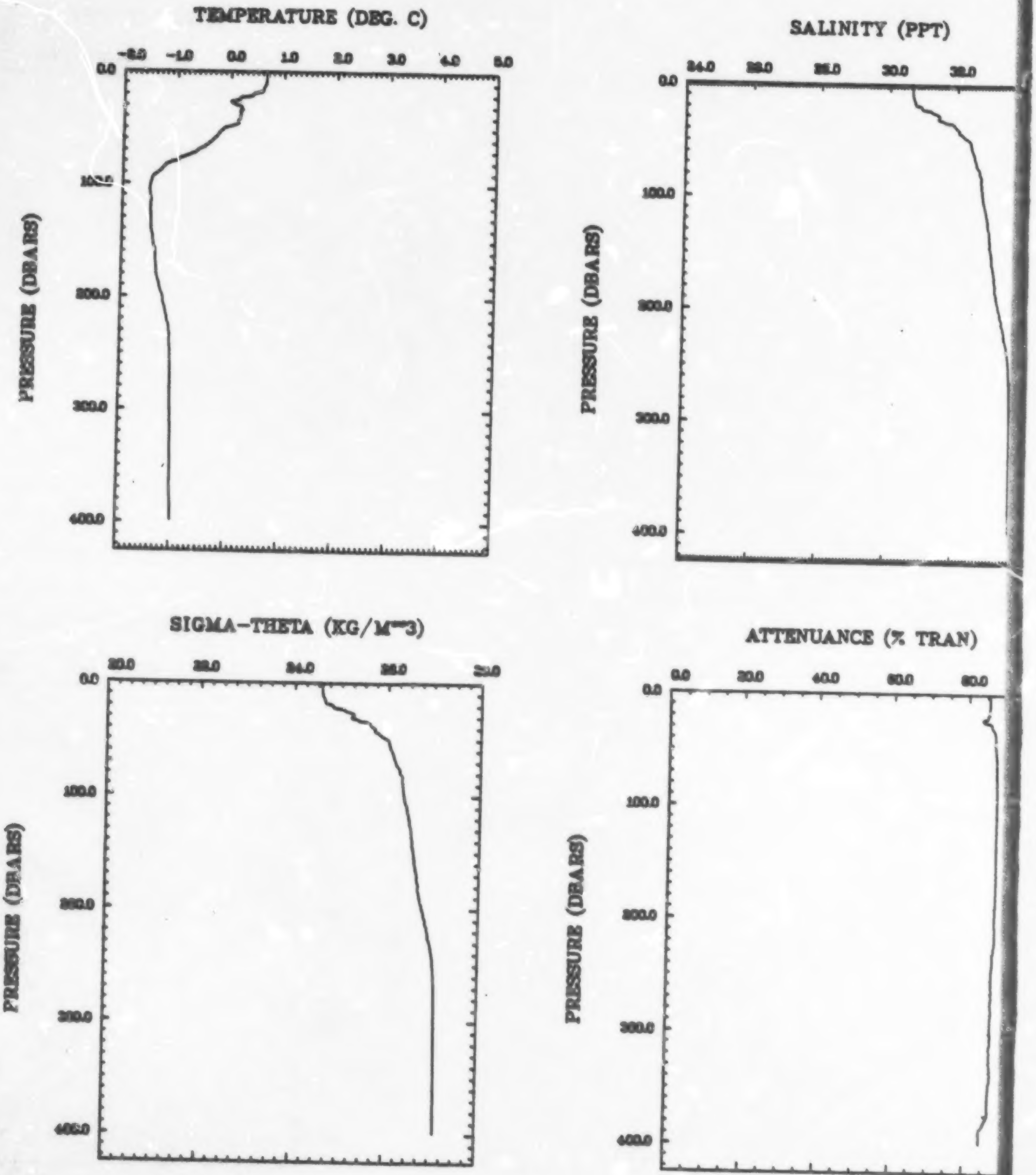

TEMPERATURE (DEG. C)


SALINITY (PPT)

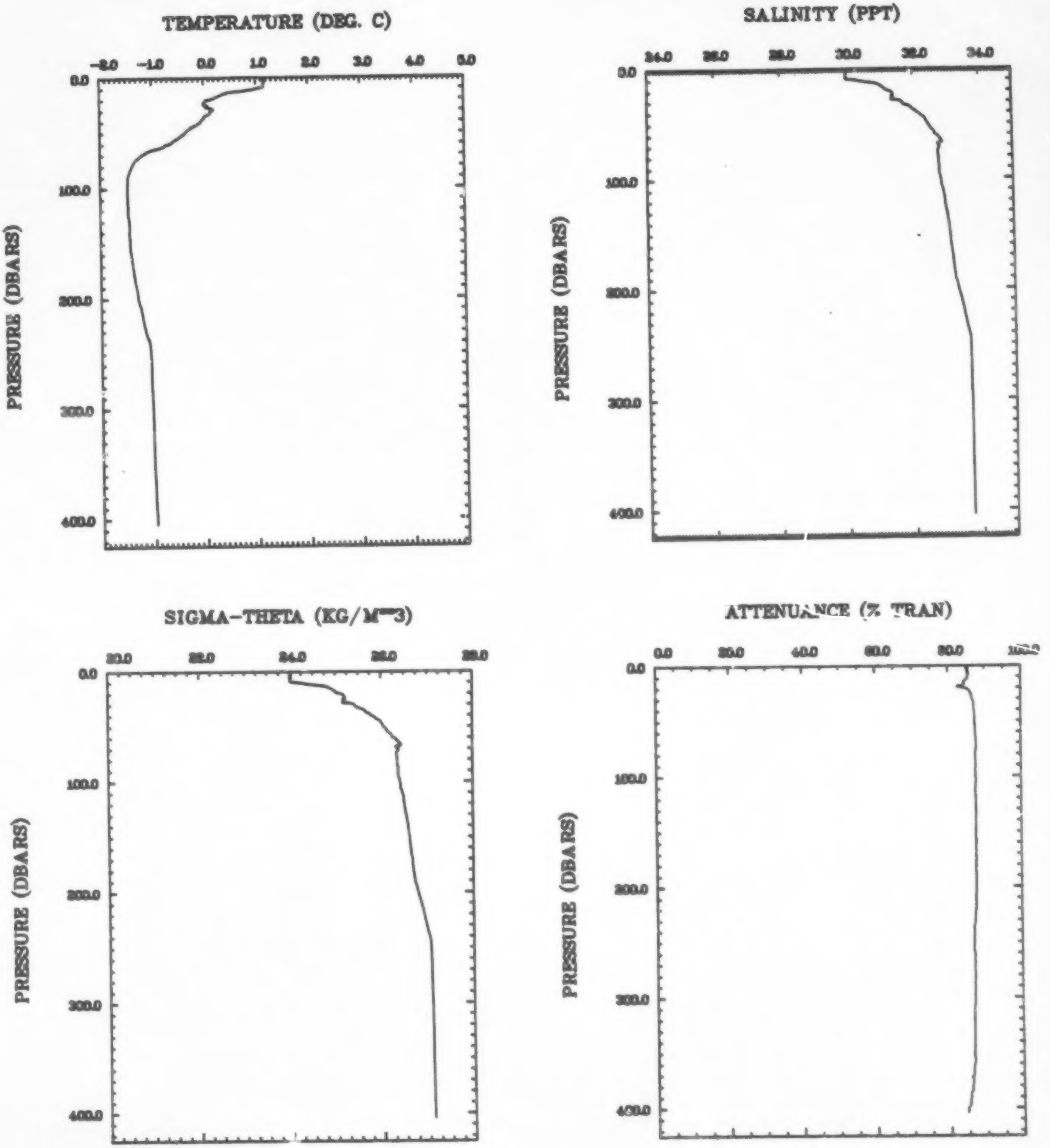

SIGMA-THETA (KG/M**3)


ATTENUANCE (% TRAN)

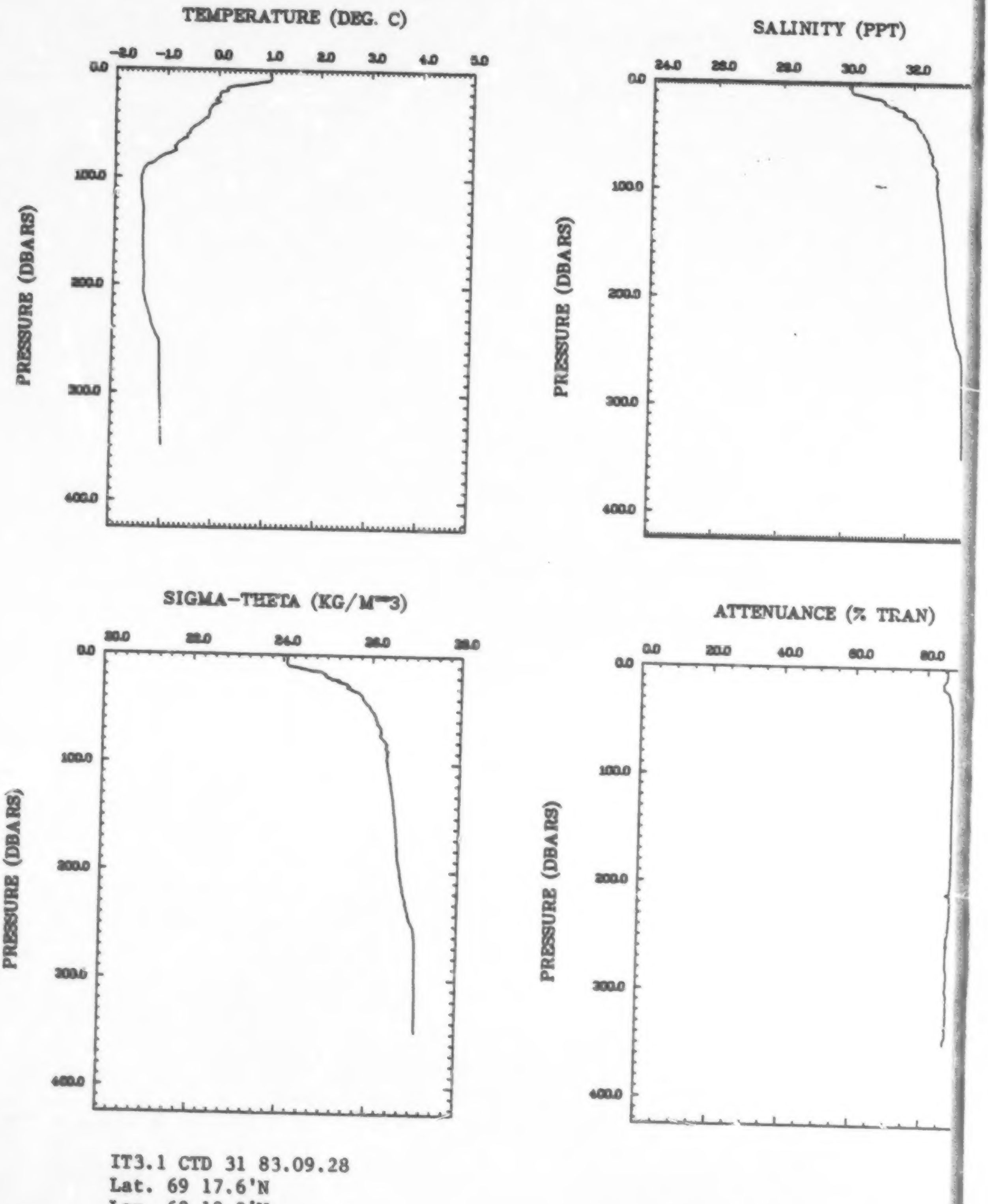
IT2.1 CTD 28 83.09.28
Lat. 69 20.3'N
Lon. 68 51.2'W



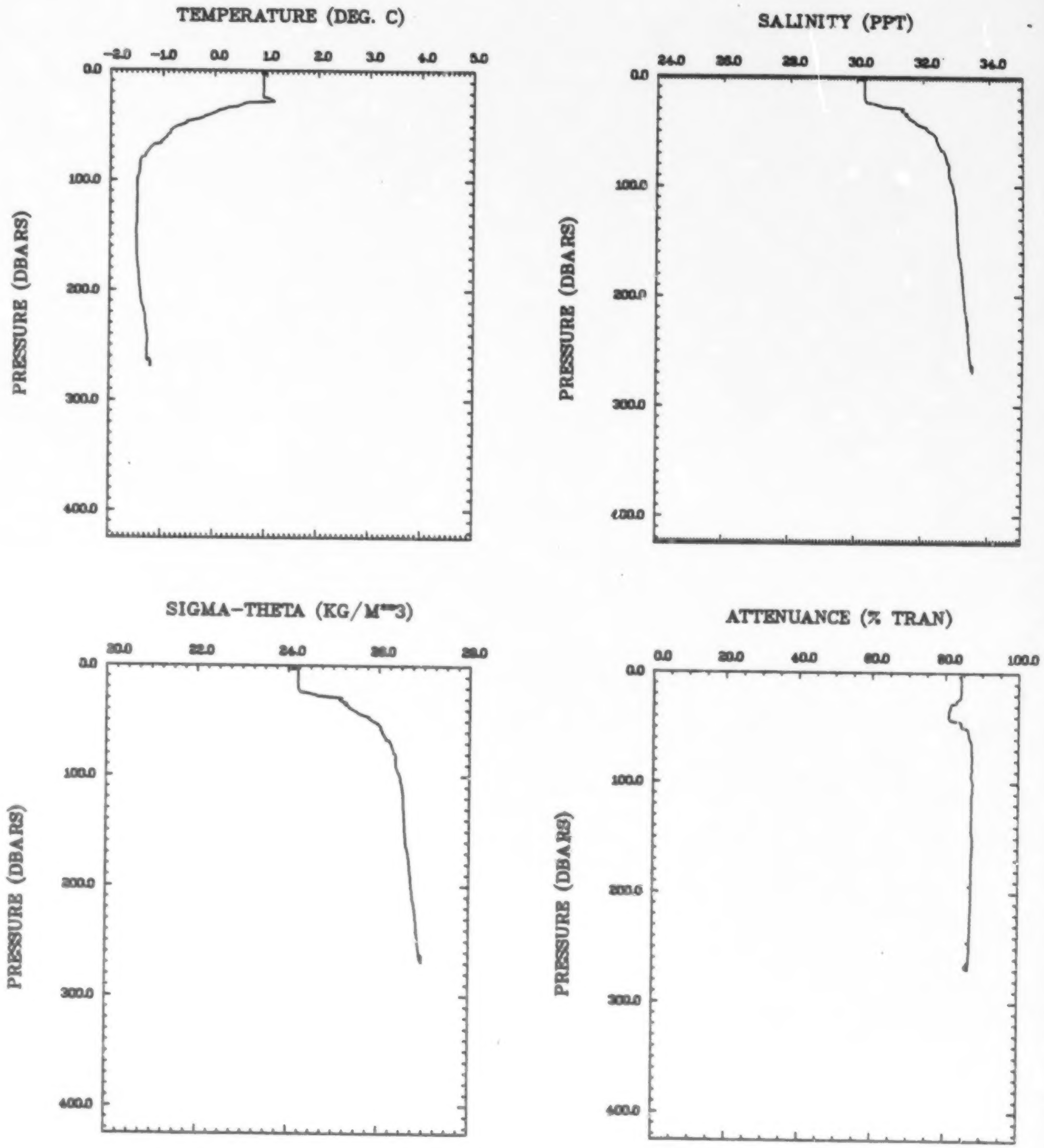
IT2.3 CTD 29 83.09.28
Lat. 69 17.5'N
Lon. 68 28.0'W



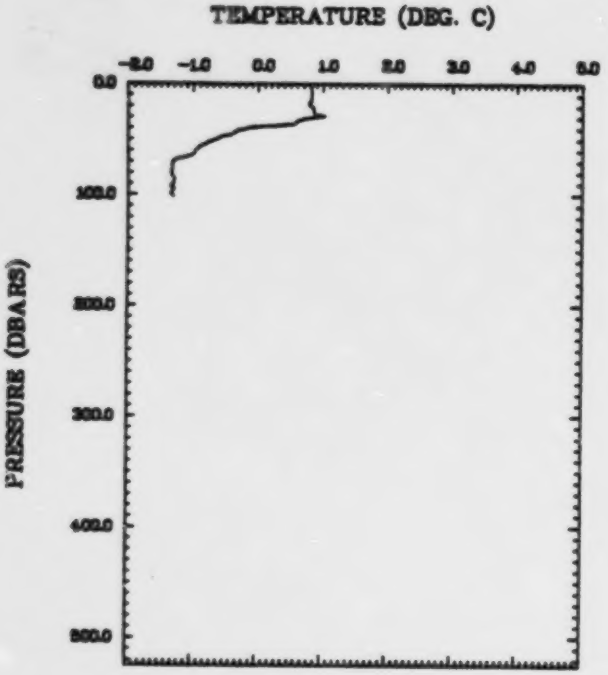
IT3.0 CTD 30 83.09.28
Lat. 69 17.0'N
Lon. 68 22.1'W

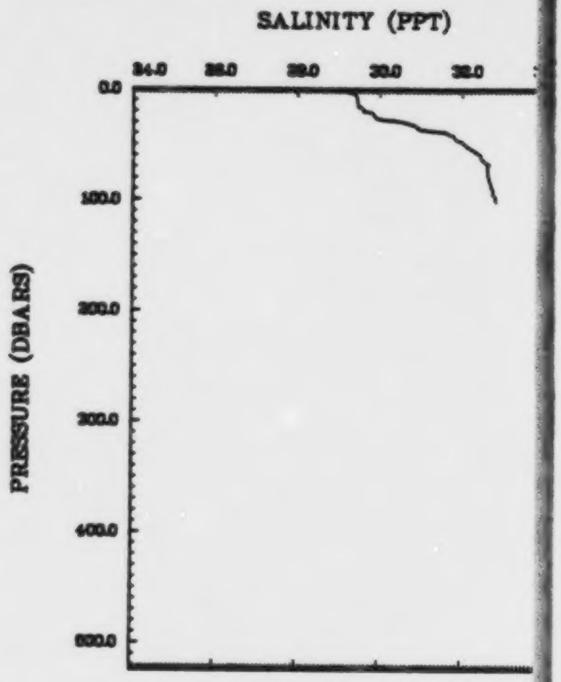


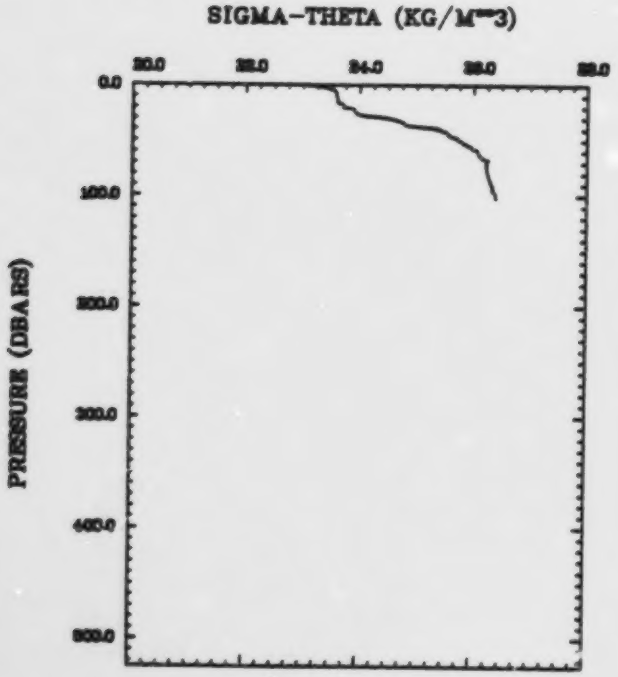
IT3.1 CTD 31 83.09.28
Lat. 69 17.6'N
Lon. 68 12.3'W

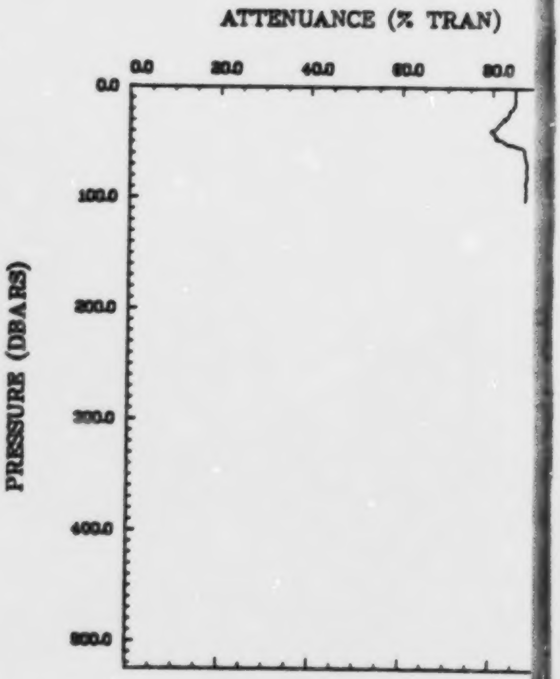


IT5 CTD 32 83.09.29
Lat. 69 4.2'N
Lon. 67 10.0'W

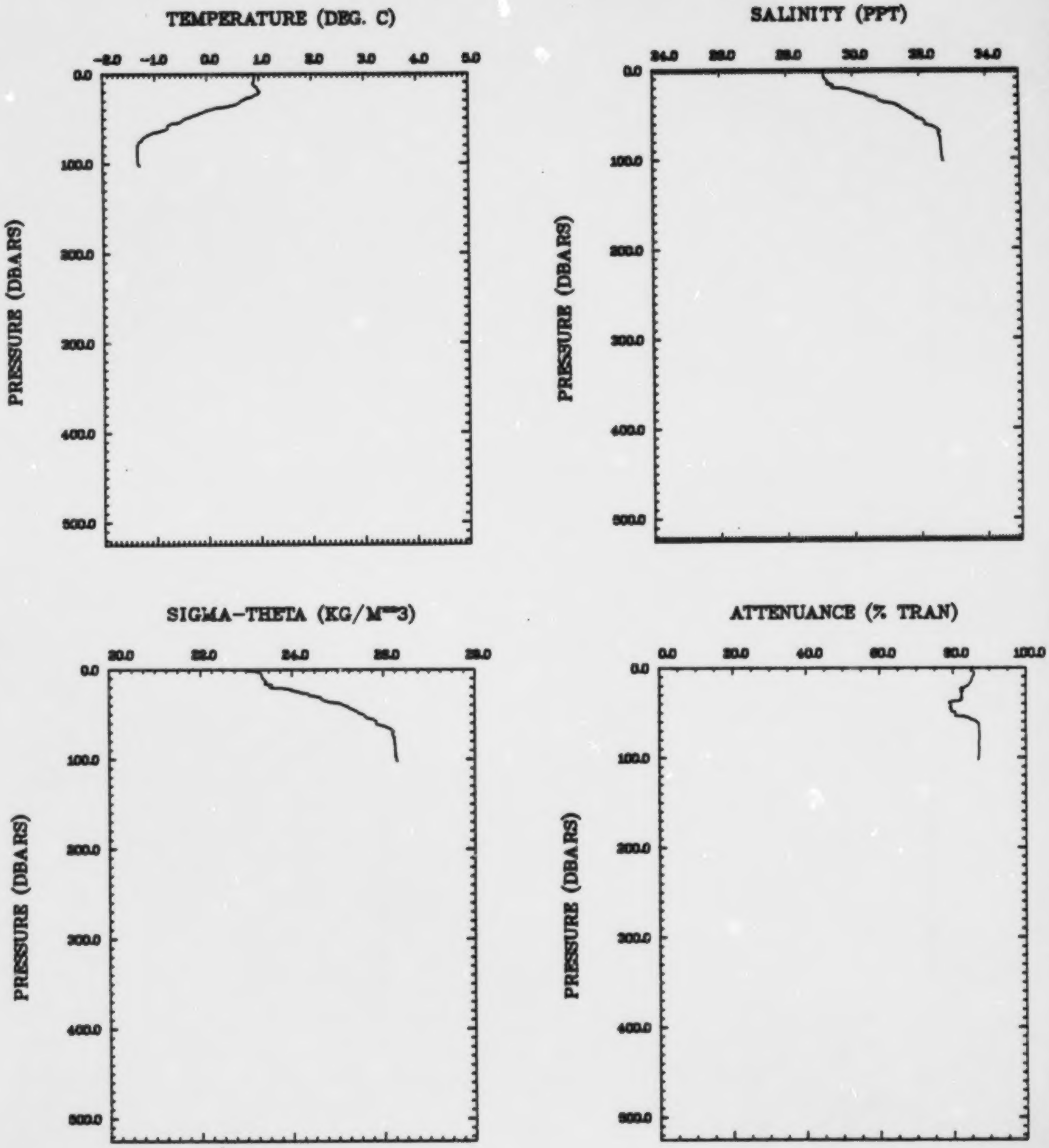

TEMPERATURE (DEG. C)


SALINITY (PPT)

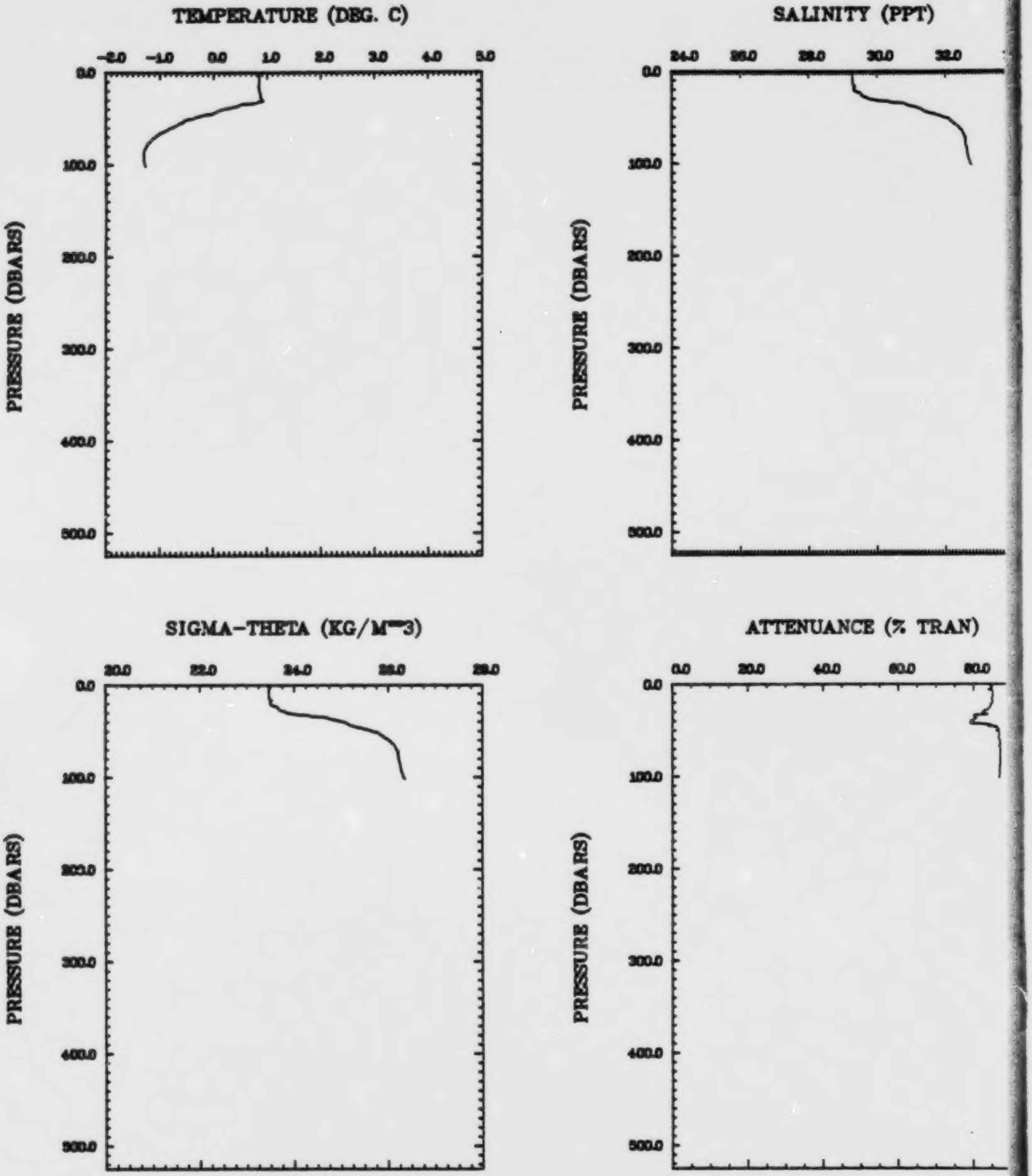

SIGMA-THETA (KG/M**3)


ATTENUANCE (% TRAN)

MC5.1 CTD 33 83.09.29
Lat. 69 34.3'N
Lon. 68 21.4'W



MC5.0 CTD 34 83.09.29
Lat. 69 36.5'N
Lon. 68 37.9'W

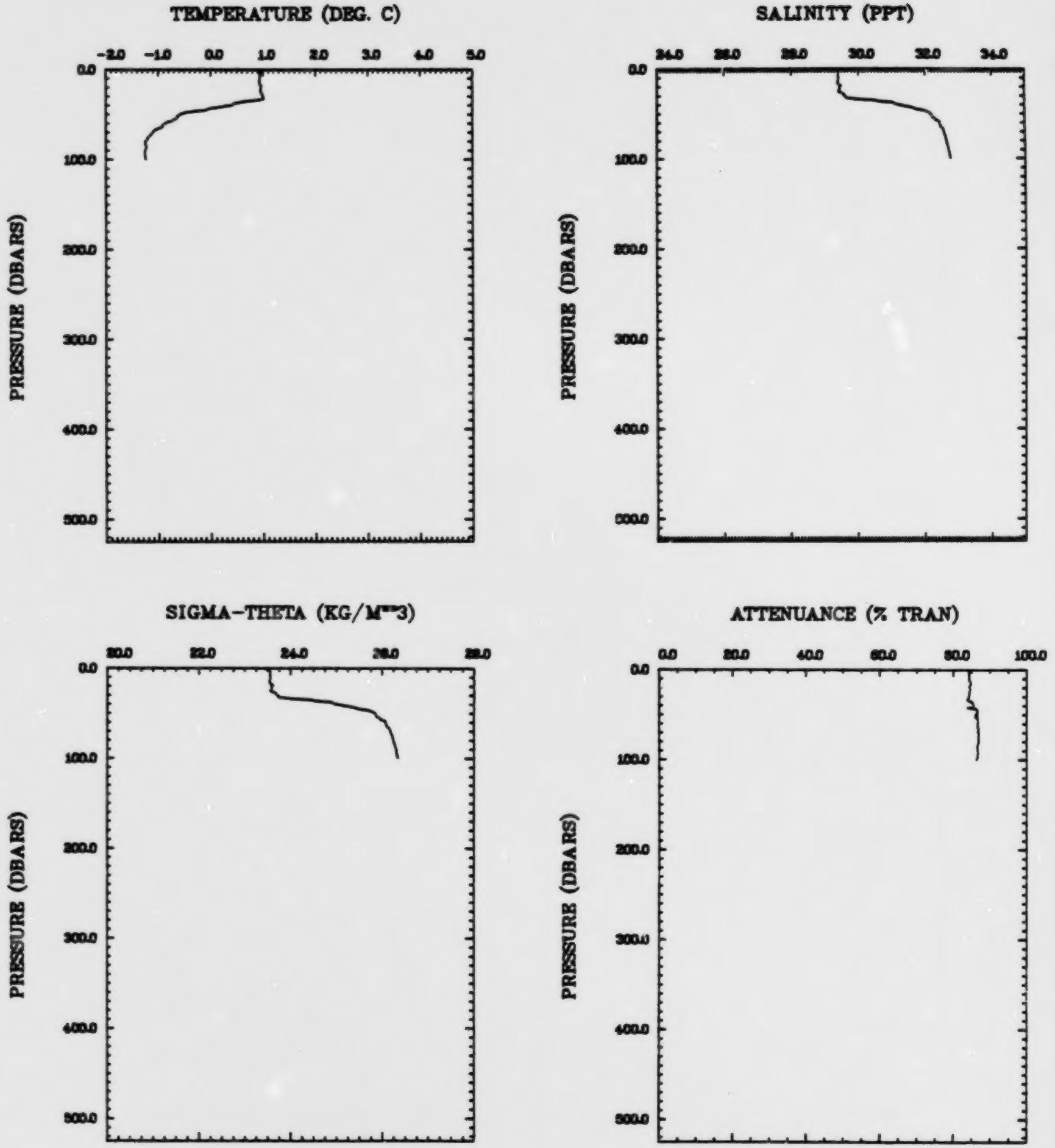

TEMPERATURE (DEG. C)

SALINITY (PPT)

SIGMA-THETA (KG/M**3)

ATTENUANCE (% TRAN)

MC4.1 CTD 35 83.09.29
Lat. 69 36.9'N
Lon. 68 44.3'W

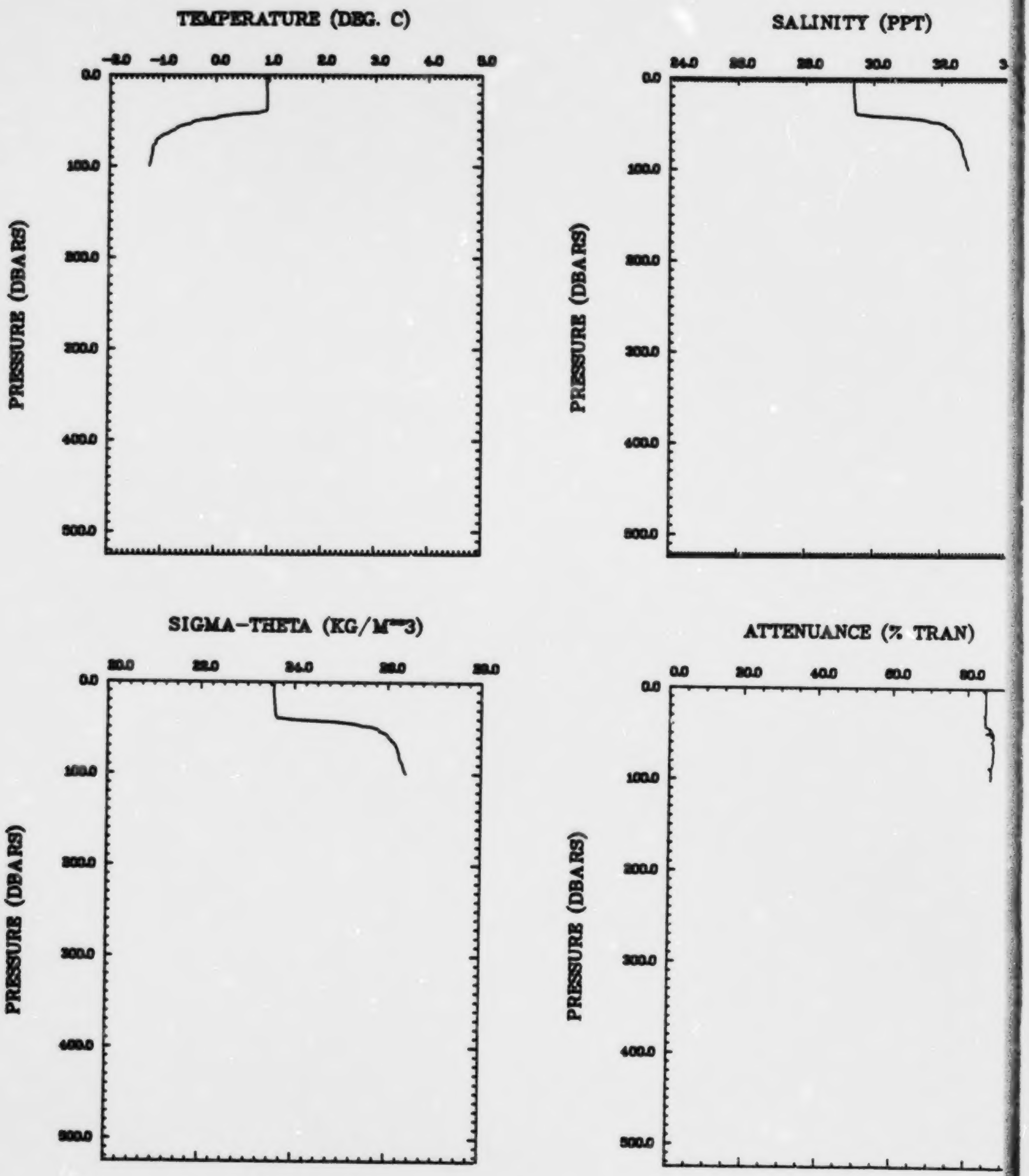

TEMPERATURE (DEG. C)

SALINITY (PPT)

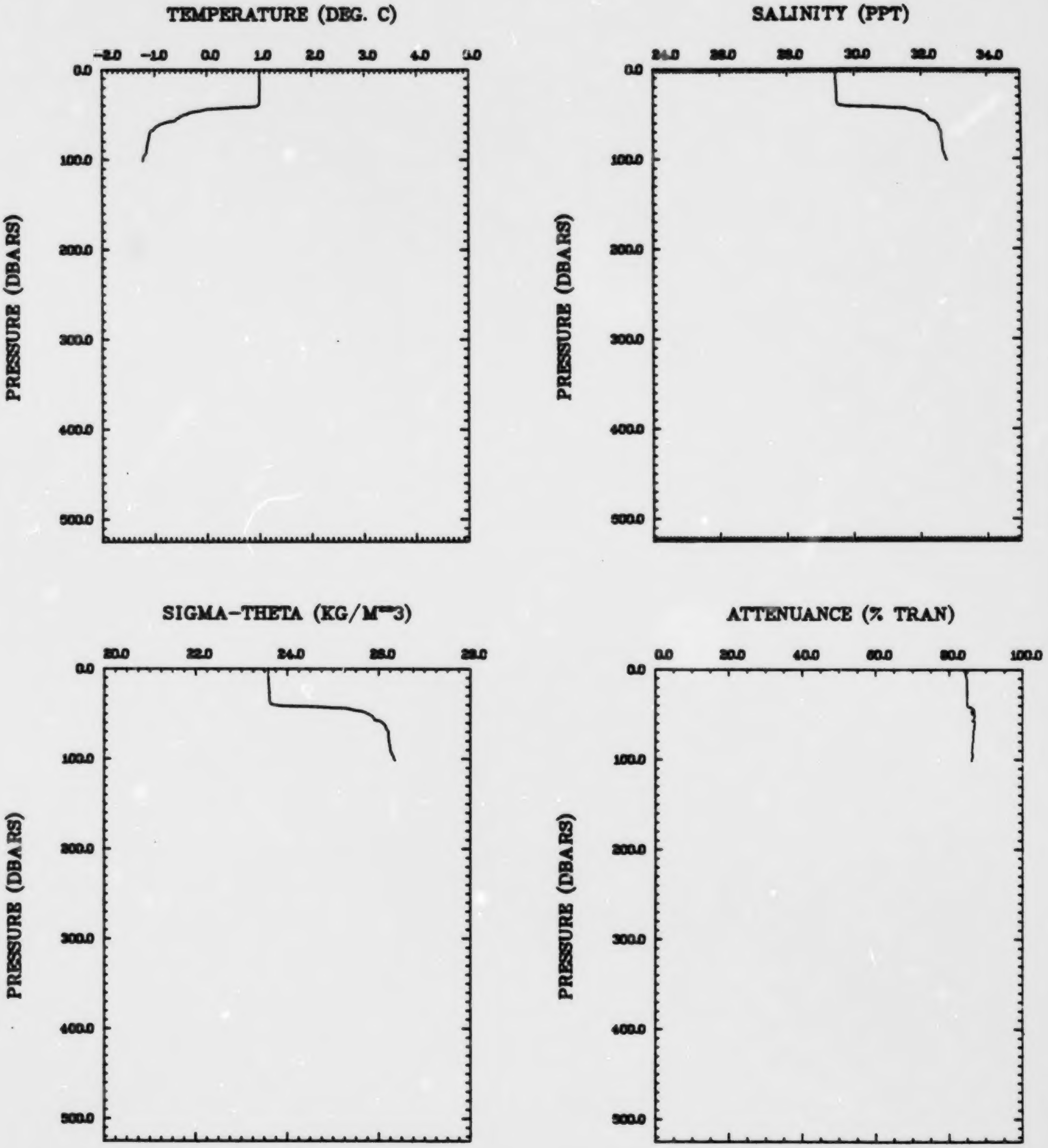
SIGMA-THETA (KG/M**3)

ATTENUANCE (% TRAN)

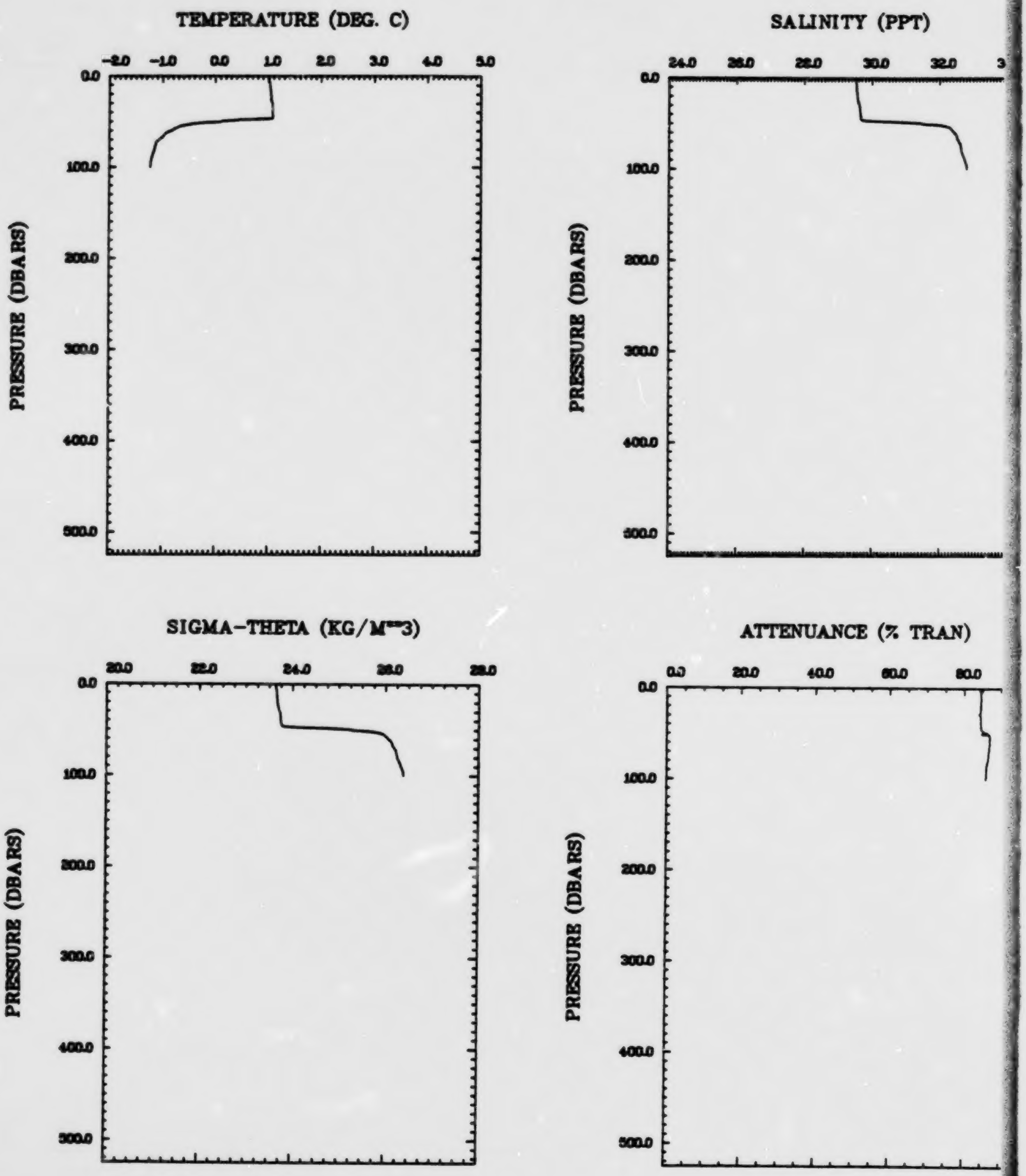
MC3.1 CTD 36 83.09.29
Lat. 69 34.4'N
Lon. 68.58.5'W



MC3 CTD 37 83.09.29
Lat. 69 31.3'N
Lon. 69 15.5'W



MC2.1 CTD 38 83.09.29
Lat. 69 32.1'N
Lon. 69 27.3'W


TEMPERATURE (DEG. C)

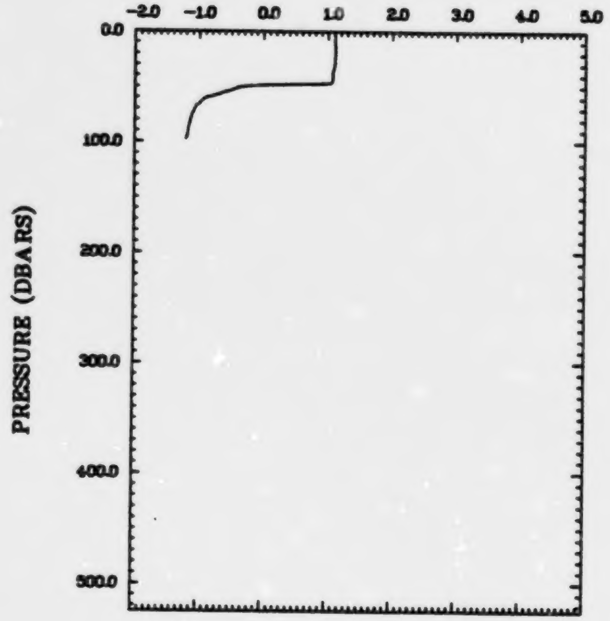
SALINITY (PPT)

SIGMA-THETA (KG/M**3)

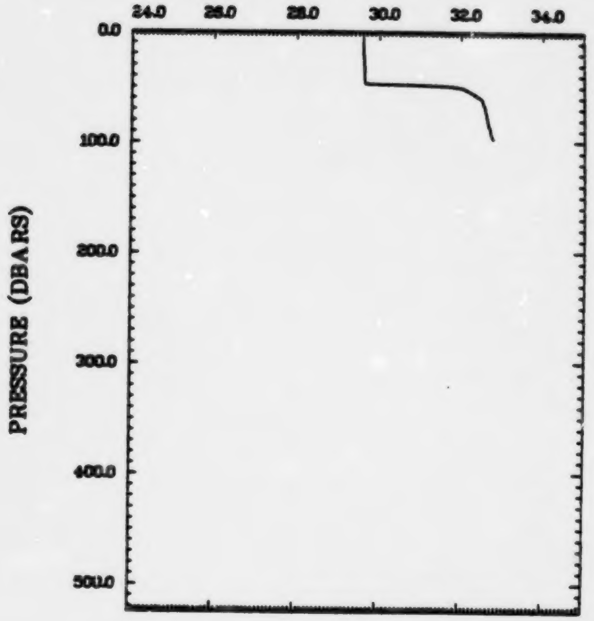
ATTENUANCE (% TRAN)

MC2 CTD 39 83.09.29
Lat. 69 33.5'N
Lon. 69 38.2'W

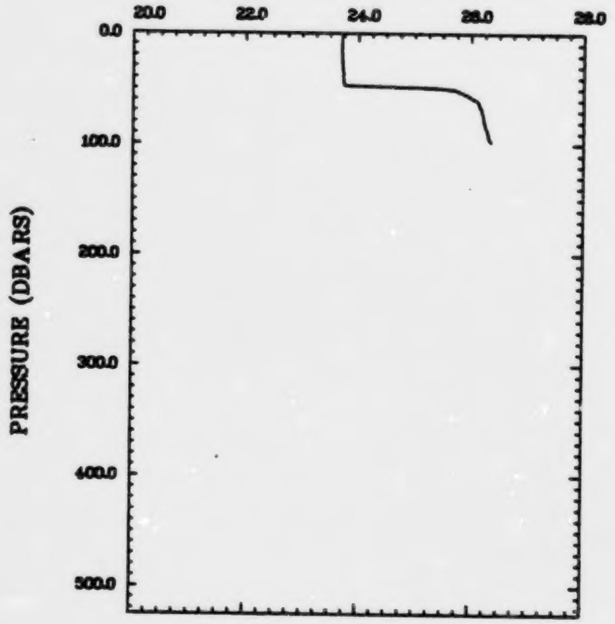
TEMPERATURE (DEG. C)



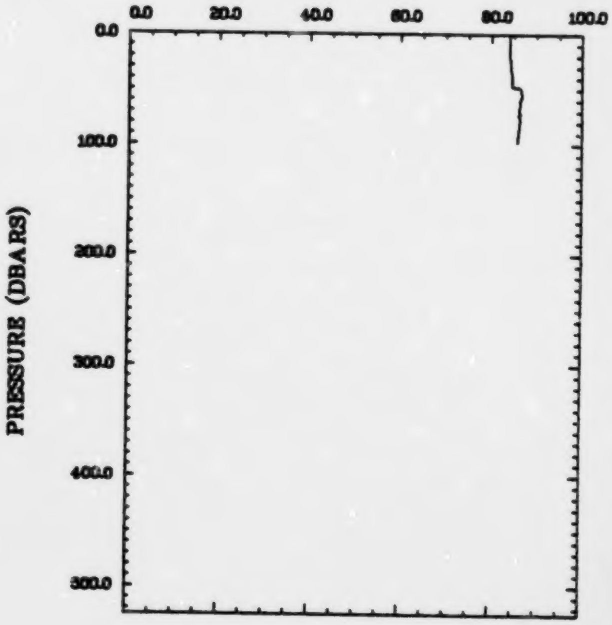
SALINITY (PPT)



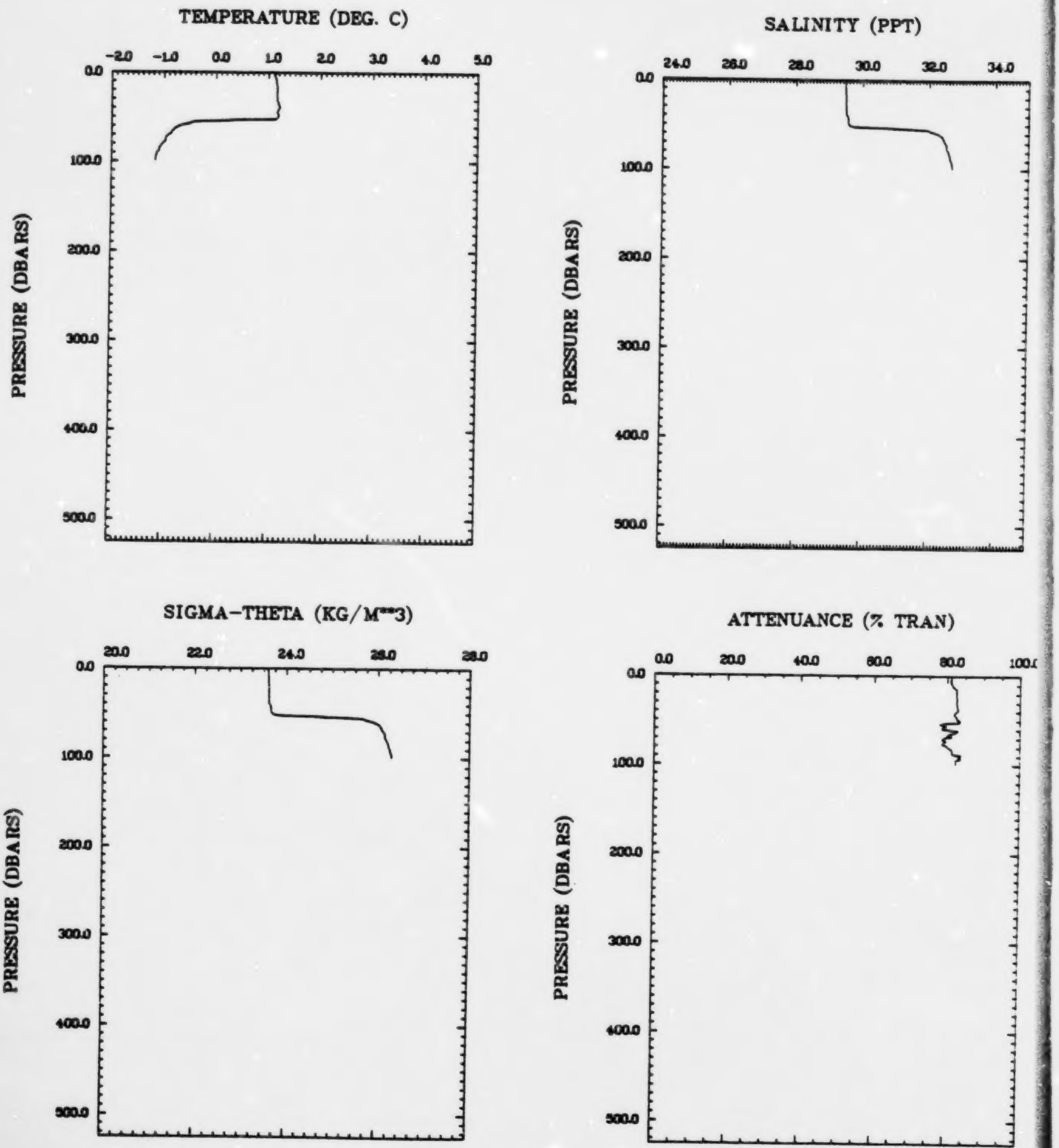
SIGMA-THETA (KG/M**3)



ATTENUANCE (% TRAN)

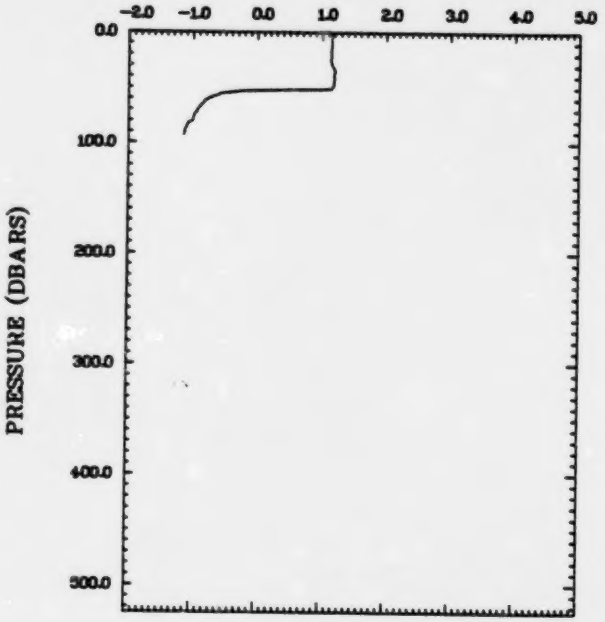


MCO.2 CTD 40 83.09.29
Lat. 69 32.5'N
Lon. 69 49.5'W

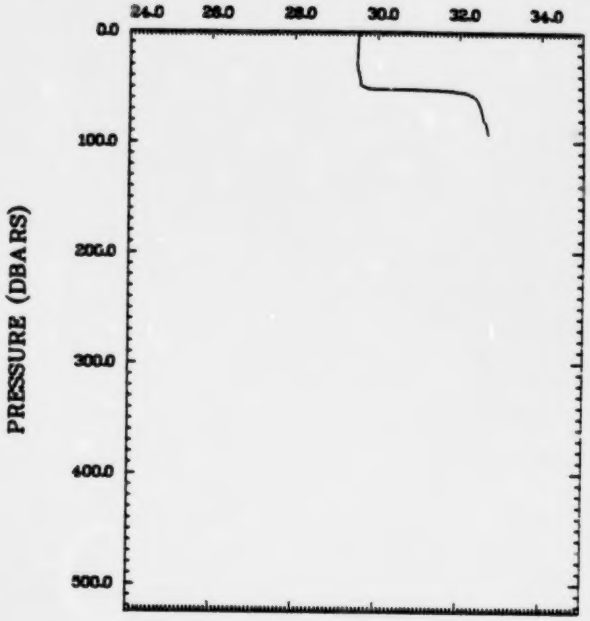


MC0.1 CTD 41 83.09.29
Lat. 69 31.9'N
Lon. 70 0.0'W

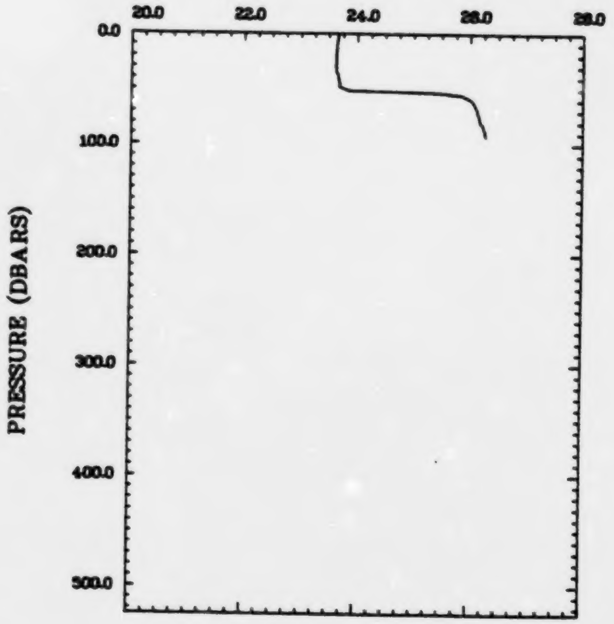
TEMPERATURE (DEG. C)



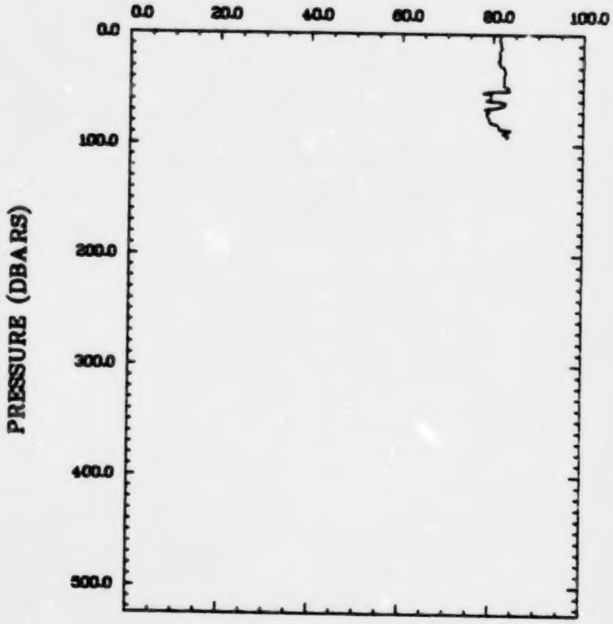
SALINITY (PPT)



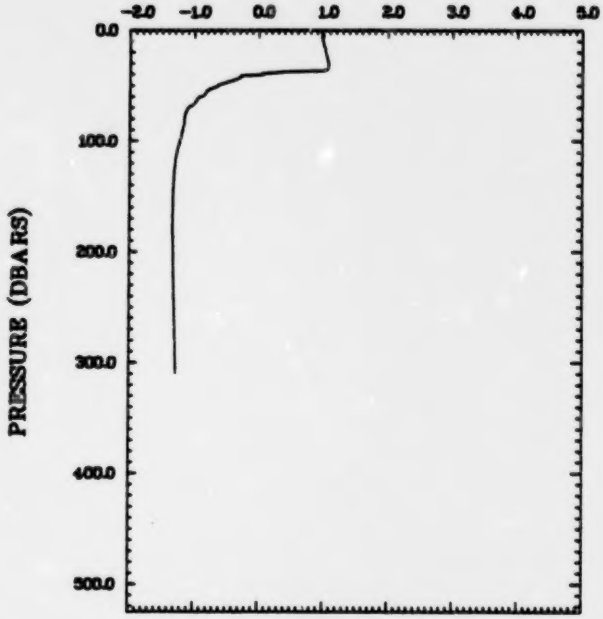
SIGMA-THETA (KG/M**3)

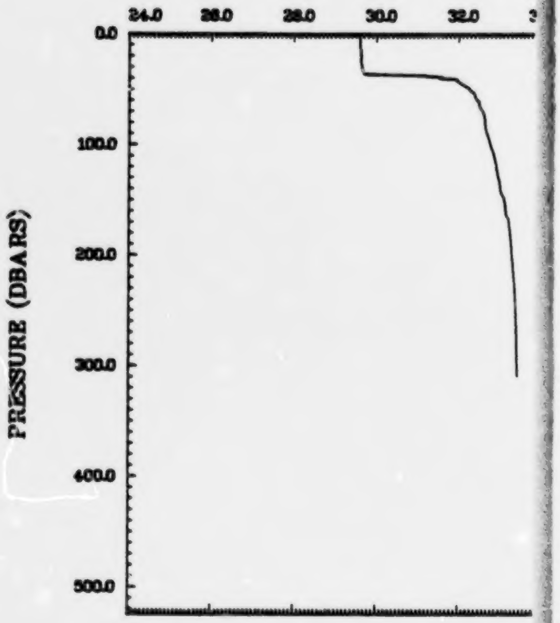


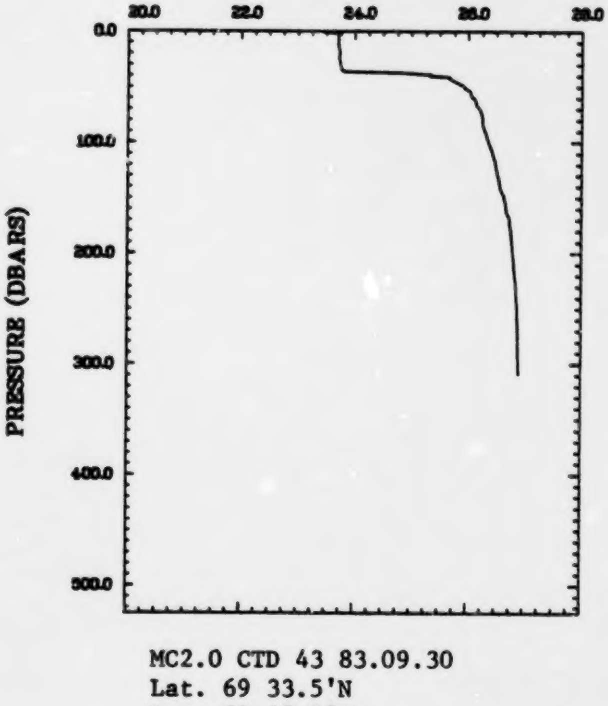
ATTENUANCE (% TRAN)

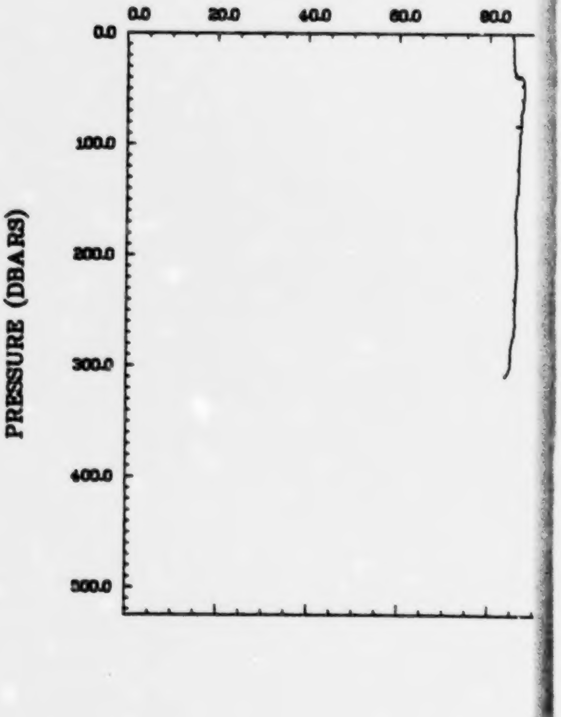


MC0.1 CTD 42 83.09.29
Lat. 69 31.9'N
Lon. 70 0.0'W

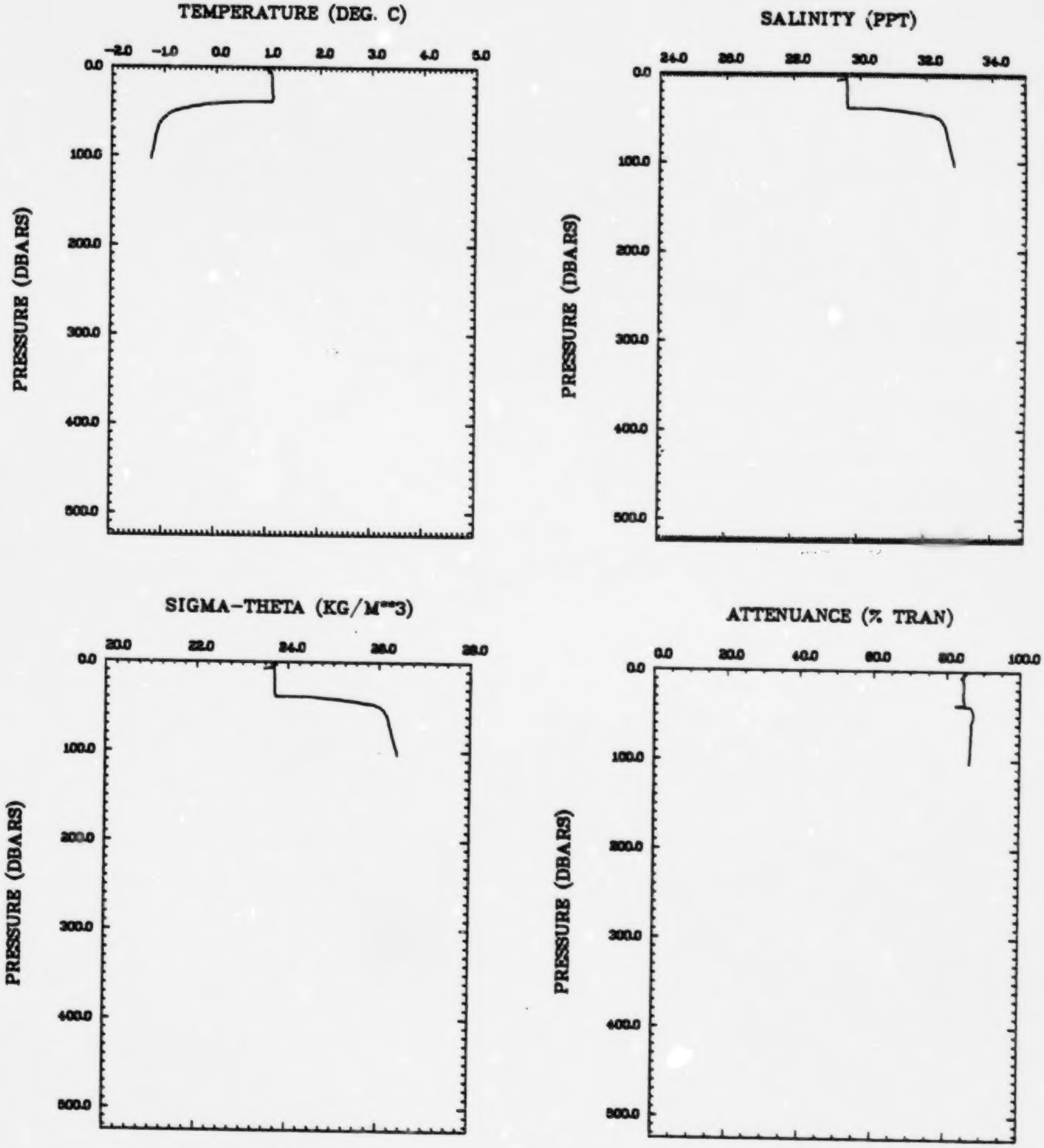

TEMPERATURE (DEG. C)


SALINITY (PPT)


SIGMA-THETA (KG/M**3)


ATTENUANCE (% TRAN)

MC2.0 CTD 43 83.09.30
Lat. 69 33.5'N
Lon. 69 40.2'W

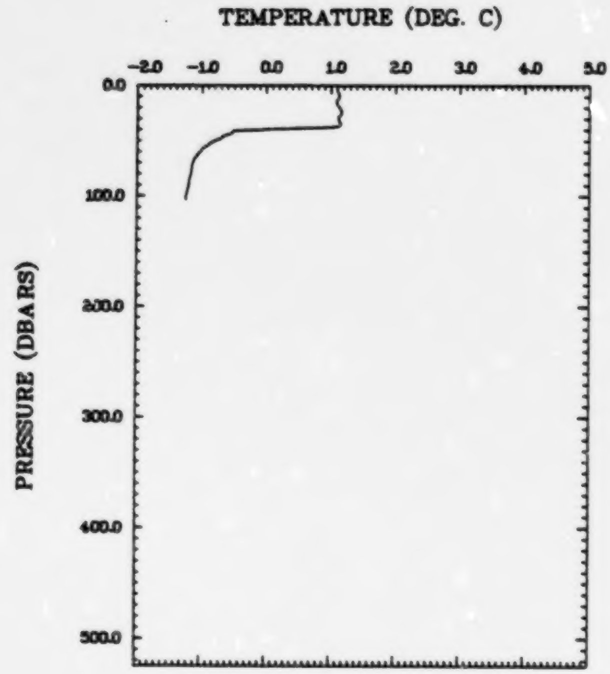

TEMPERATURE (DEG. C)

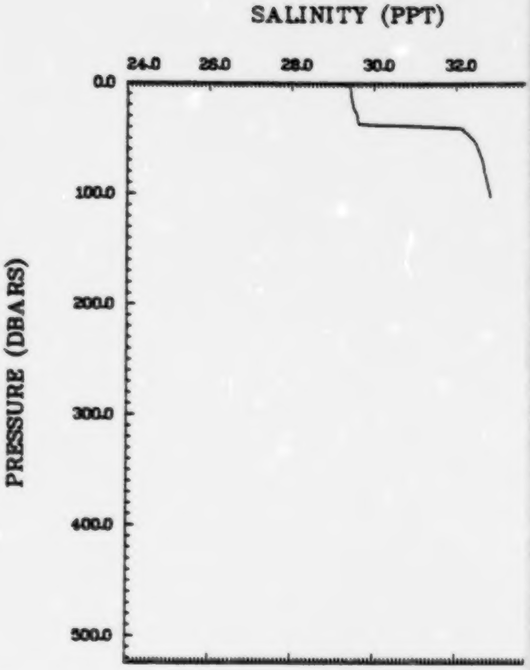
SALINITY (PPT)

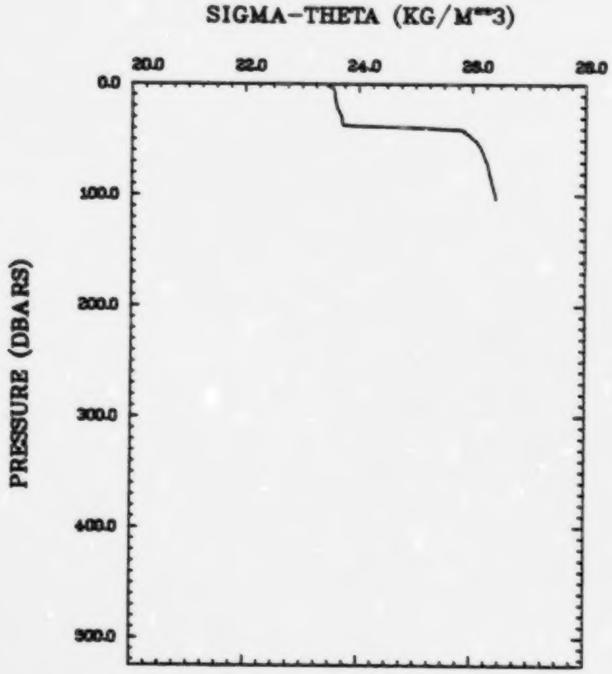
SIGMA-THETA (KG/M**3)

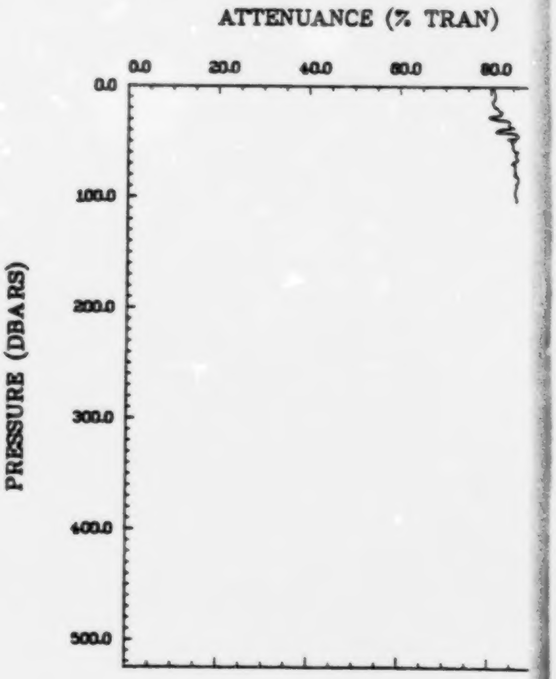
ATTENUANCE (% TRAN)

MC1.2 CTD 44 83.09.30
Lat. 69 32.4'N
Lon. 69 50.1'W

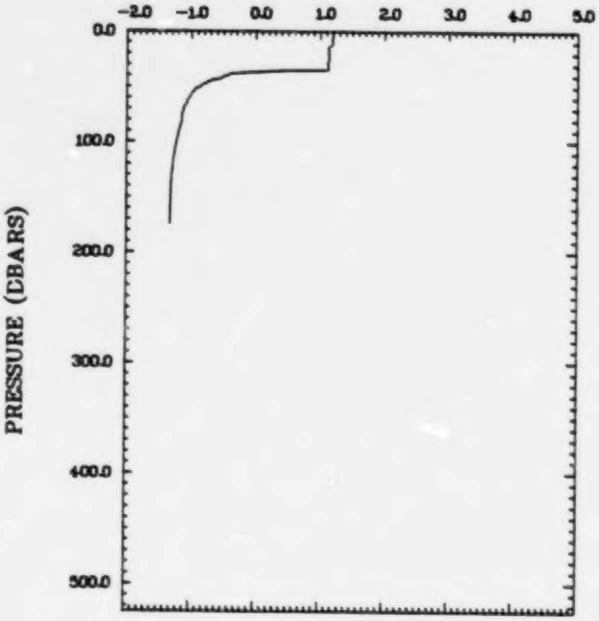


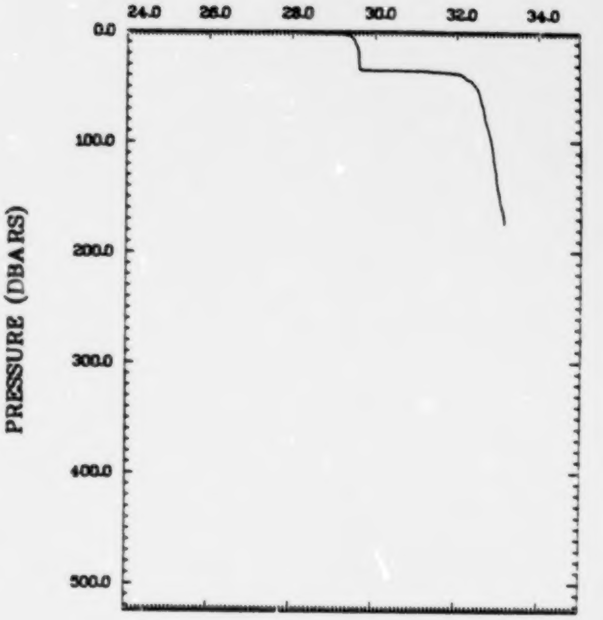


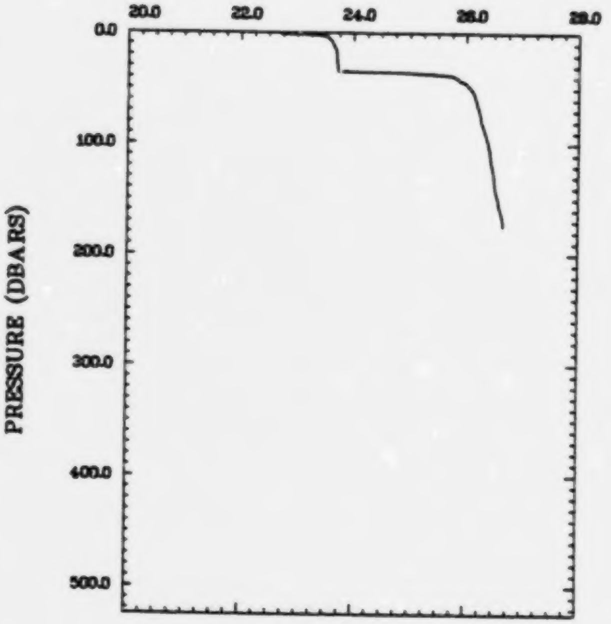


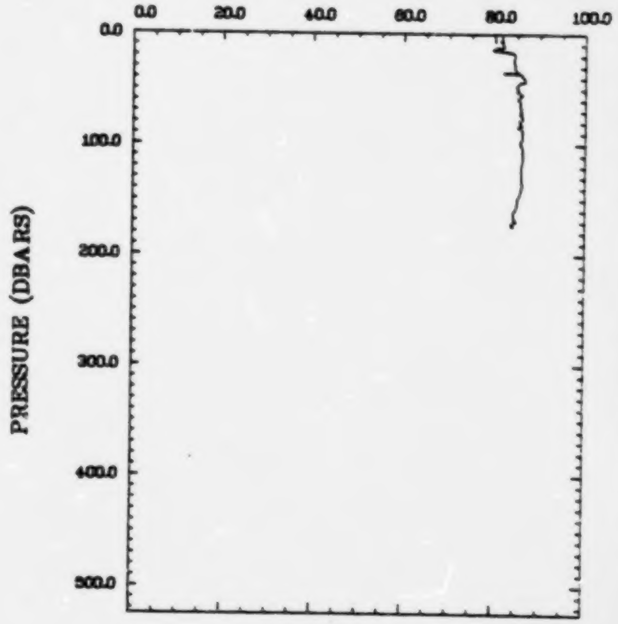


MC0.1 CTD 45 83.09.30
Lat. 69 31.0'N
Lon. 69 57.0'W

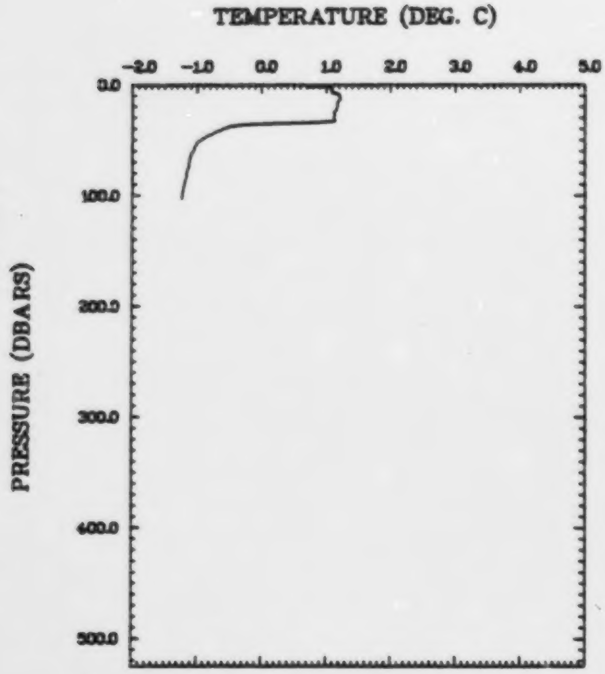

TEMPERATURE (DEG. C)

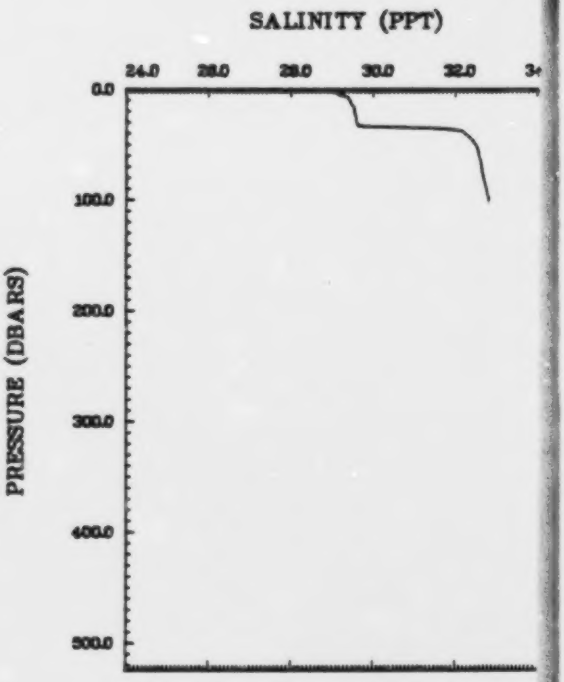

SALINITY (PPT)

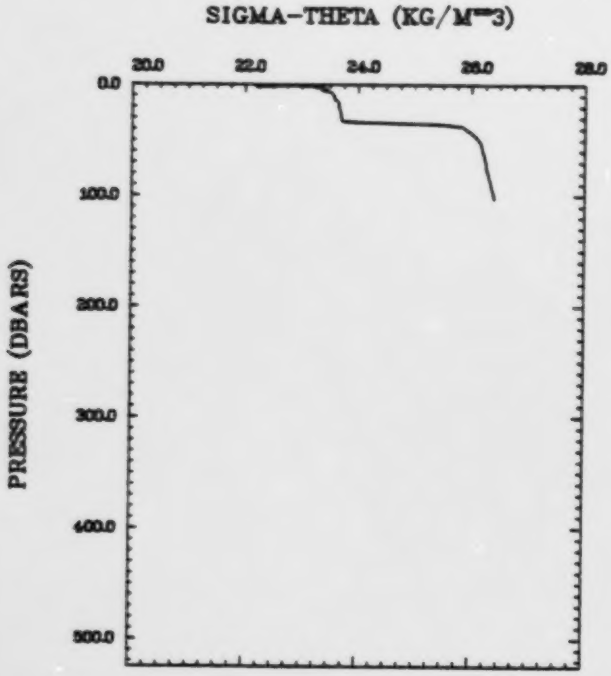

SIGMA-THETA (KG/M**3)

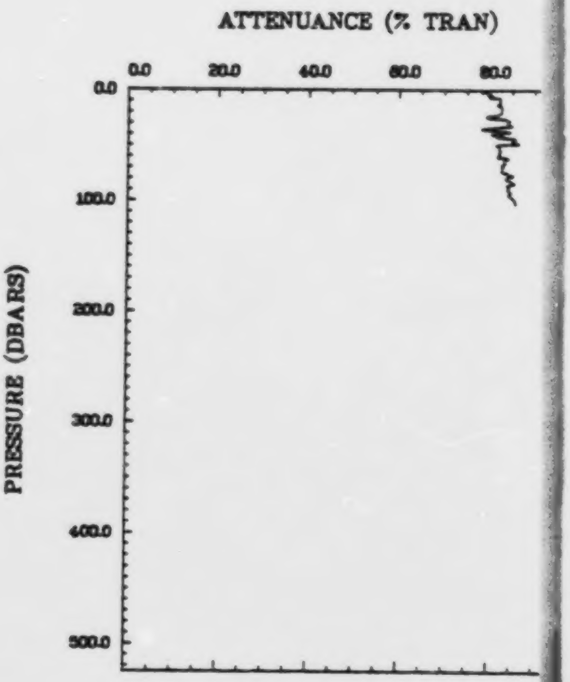

ATTENUANCE (% TRAN)

MC0.1 CTD 46 83.09.30
Lat. 69 31.0'N
Lon. 69 57.0'W

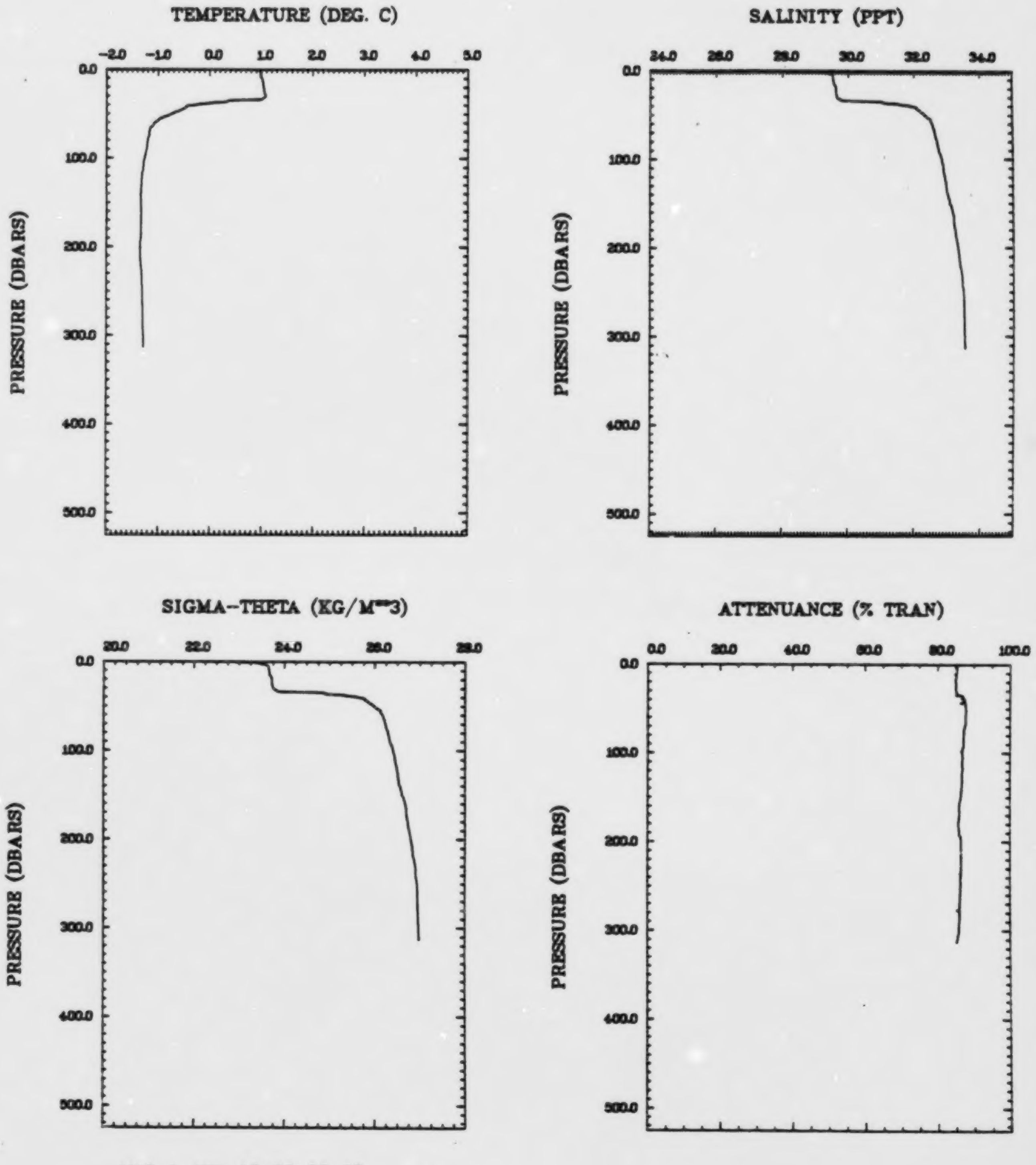

TEMPERATURE (DEG. C)


SALINITY (PPT)

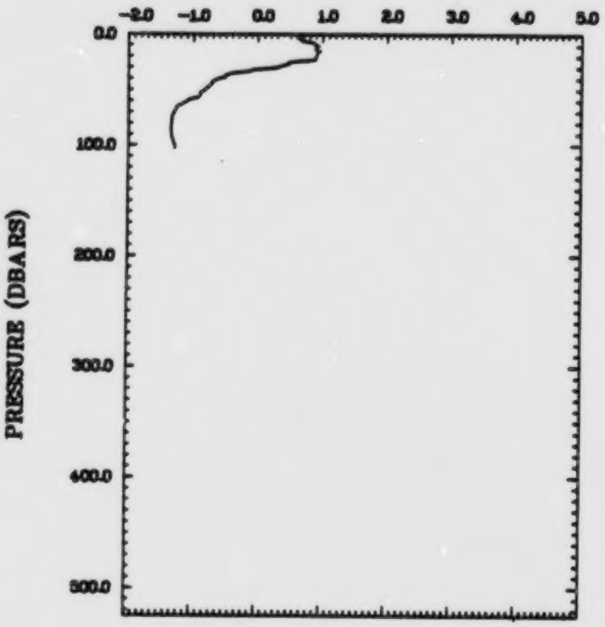

SIGMA-THETA (KG/M**3)

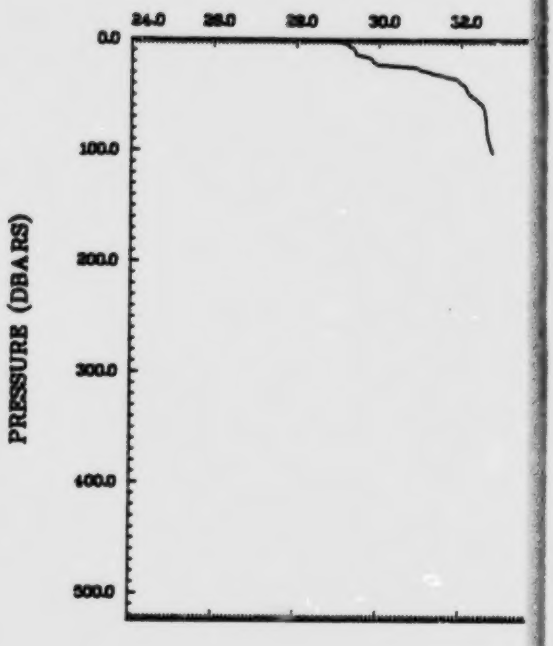

ATTENUANCE (% TRAN)

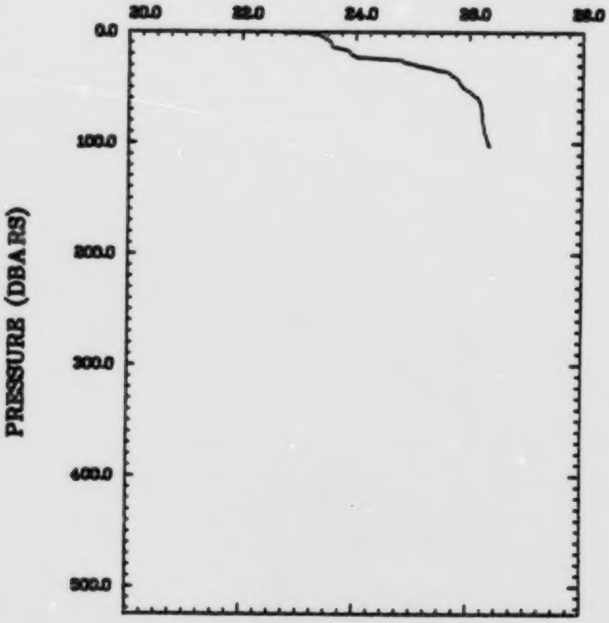
MCO.1 CTD 47 83.09.30
Lat. 69 31.0'N
Lon. 69 57.0'W

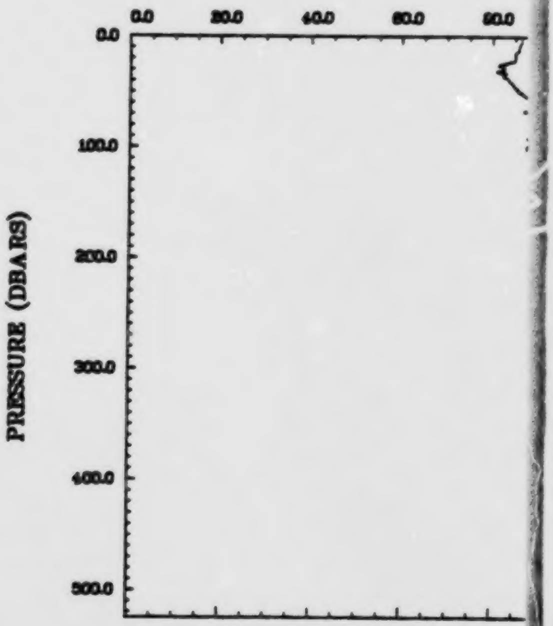


MC2.1 CTD 48 83.09.30
Lat. 69 32.2'N
Lon. 69 27.3'W

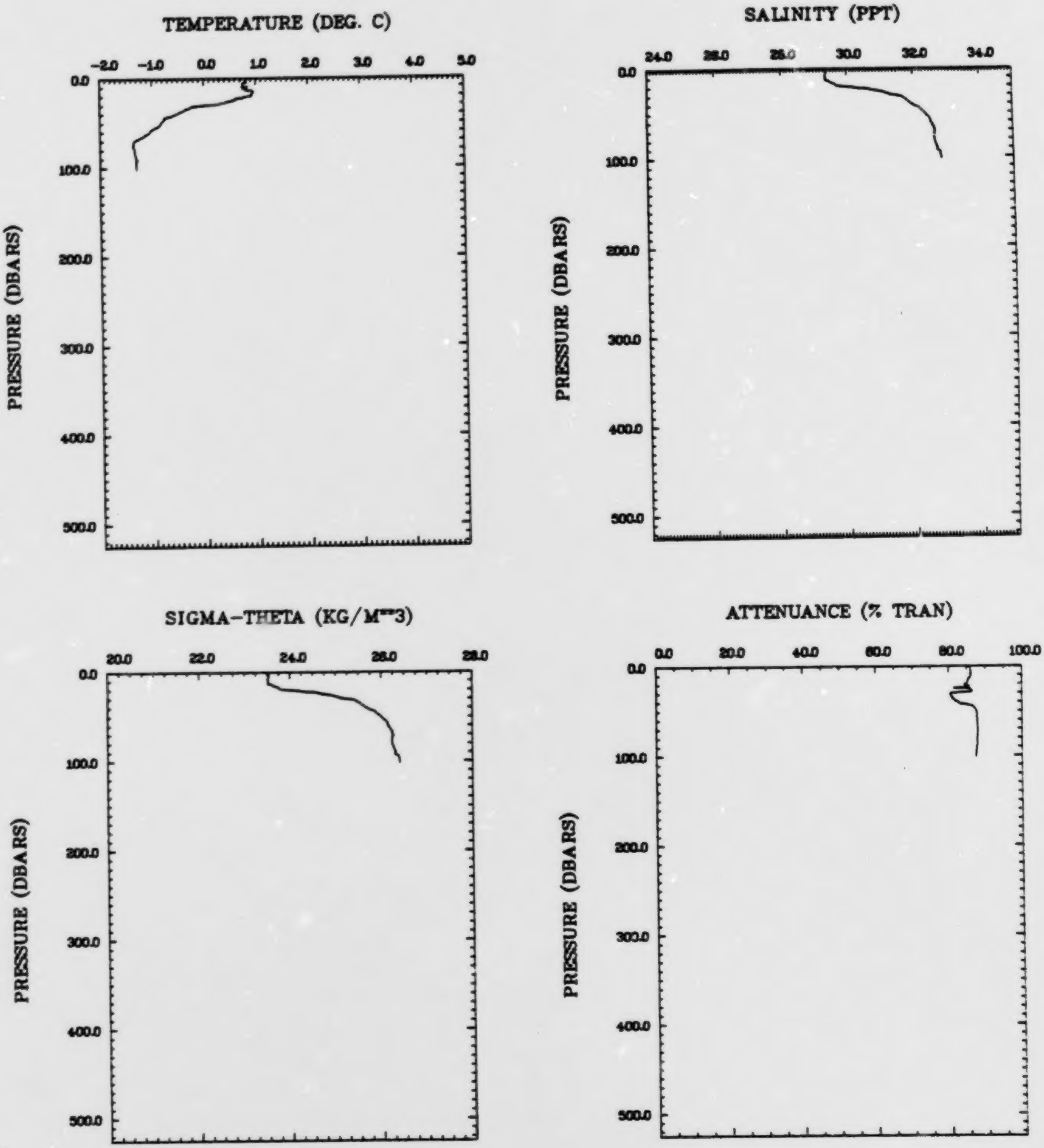

TEMPERATURE (DEG. C)


SALINITY (PPT)

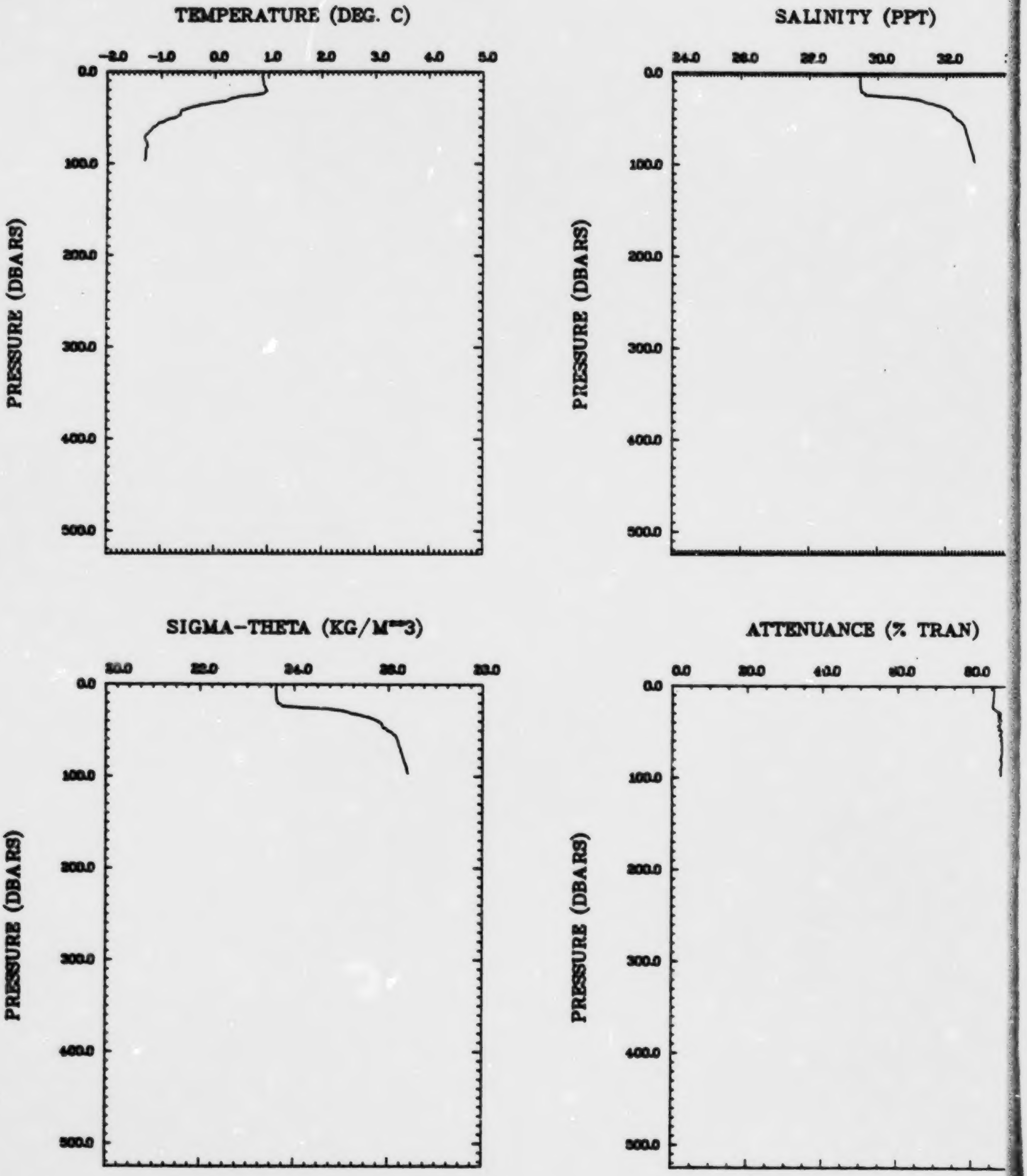

SIGMA-THETA (KG/M**3)


ATTENUANCE (% TRAN)

MC5.0 CTD 49 83.10.01
Lat. 69 36.5'N
Lon. 68 34.9'W



MC4.1 CTD 50 83.10.01
Lat. 69 36.9'N
Lon. 68 44.3'W



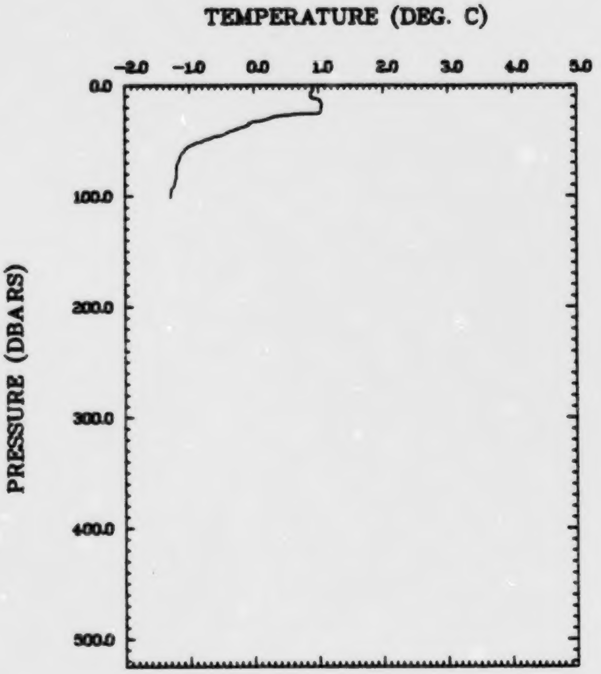
TEMPERATURE (DEG. C)

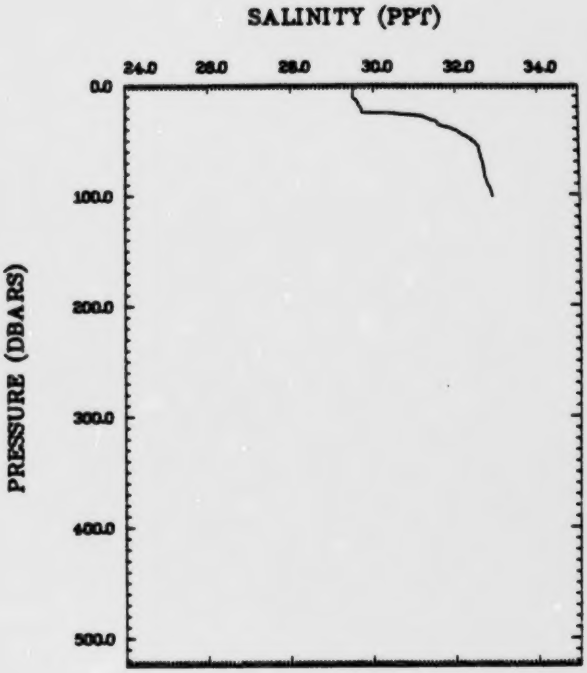
SALINITY (PPT)

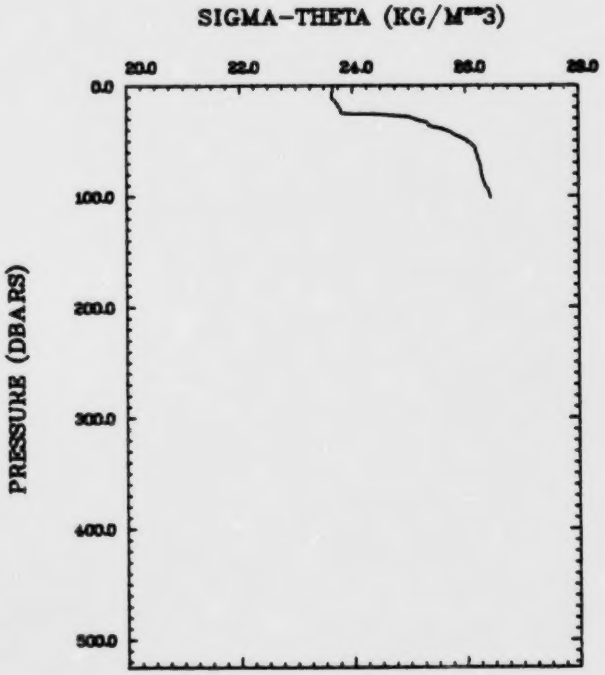
SIGMA-THETA (KG/M**3)

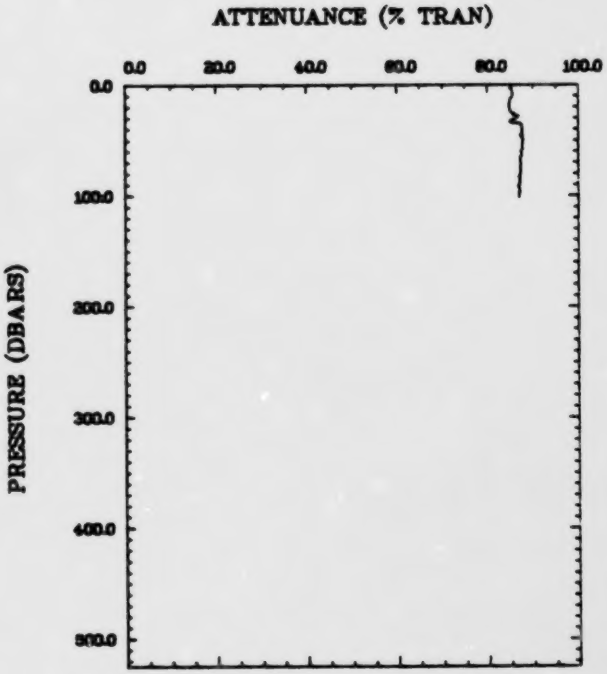
ATTENUANCE (% TRAN)

MC3.1 CTD 51 83.10.01
Lat. 69 34.4'N
Lon. 68 58.5'W



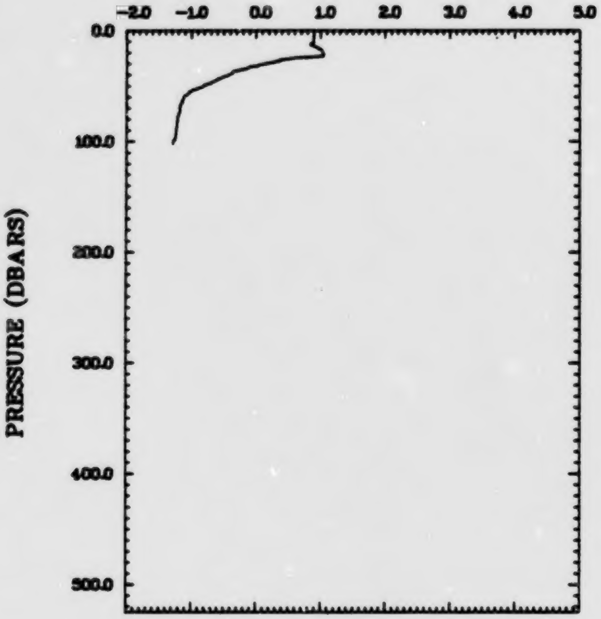




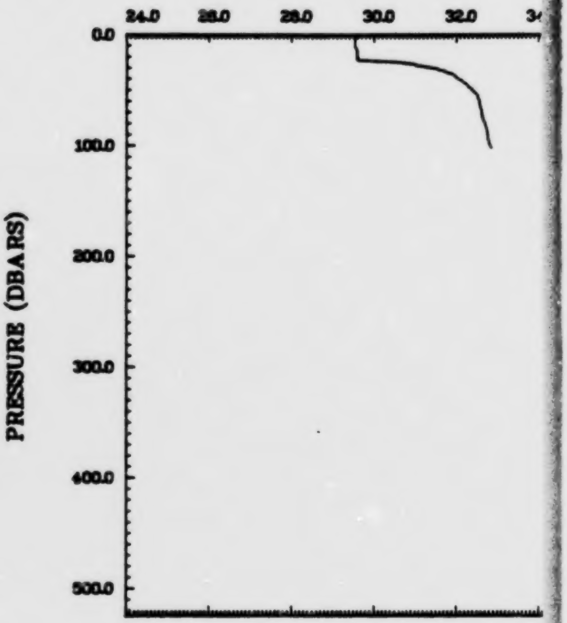


MC3 CTD 52 83.10.01
Lat. 69 31.3'N
Lon. 69 15.5'W

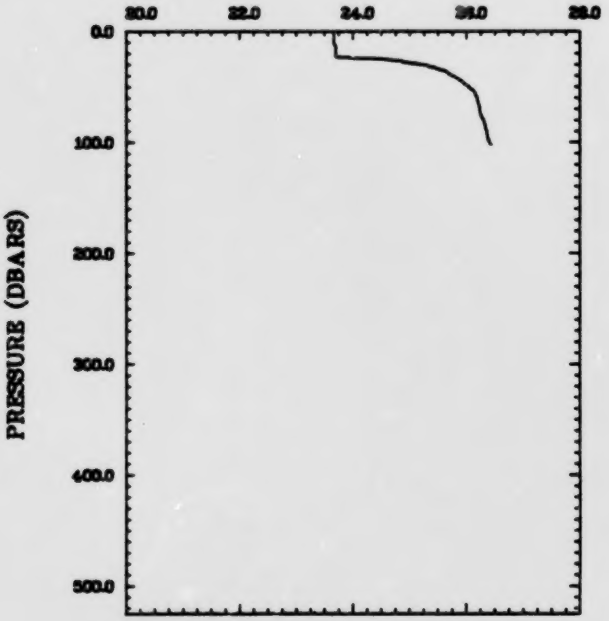
TEMPERATURE (DEG. C)



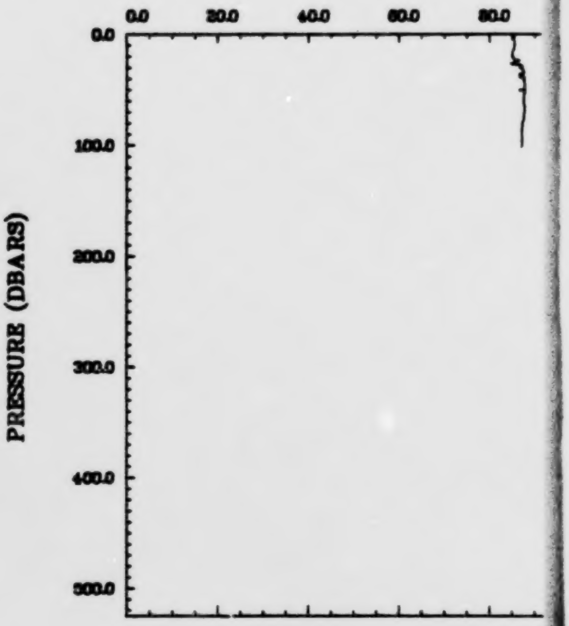
SALINITY (PPT)



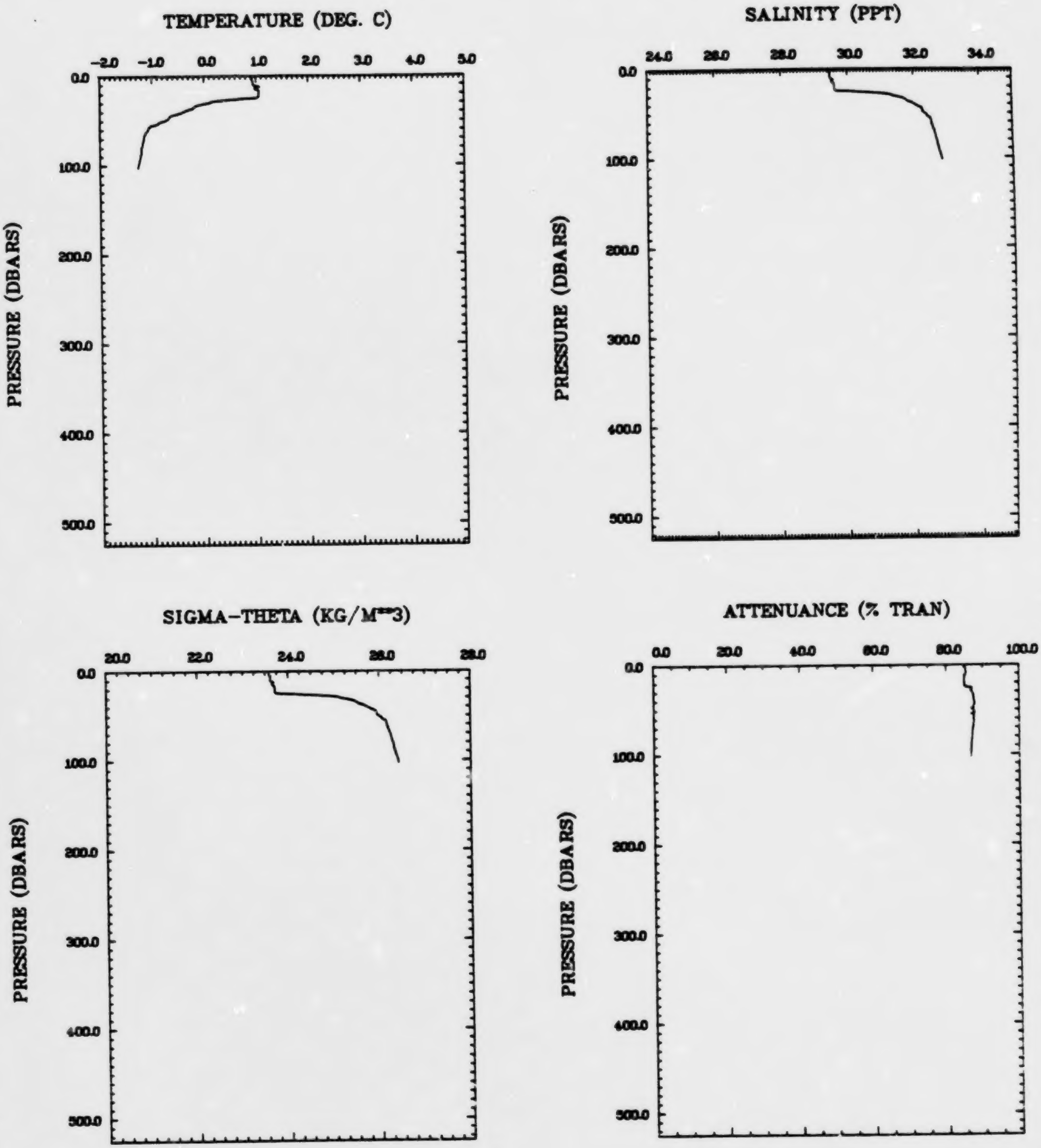
SIGMA-THETA (KG/M**3)



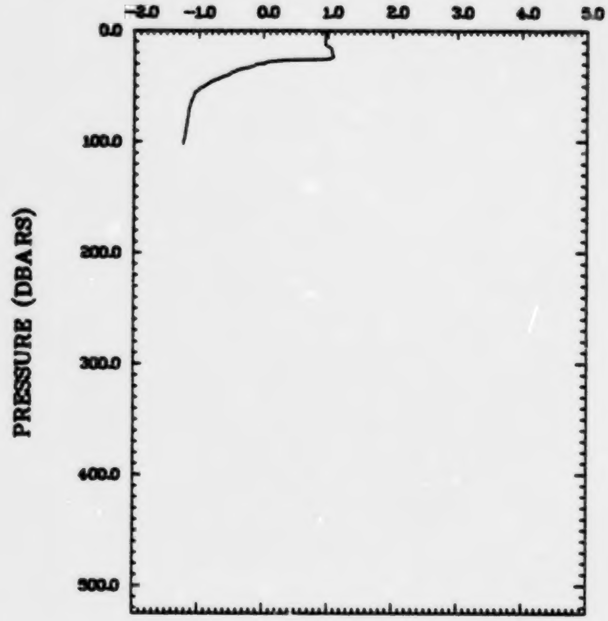
ATTENUANCE (% TRAN)

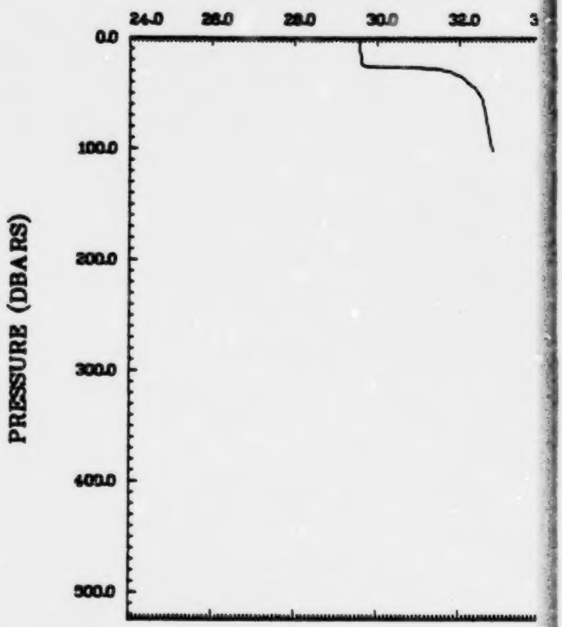


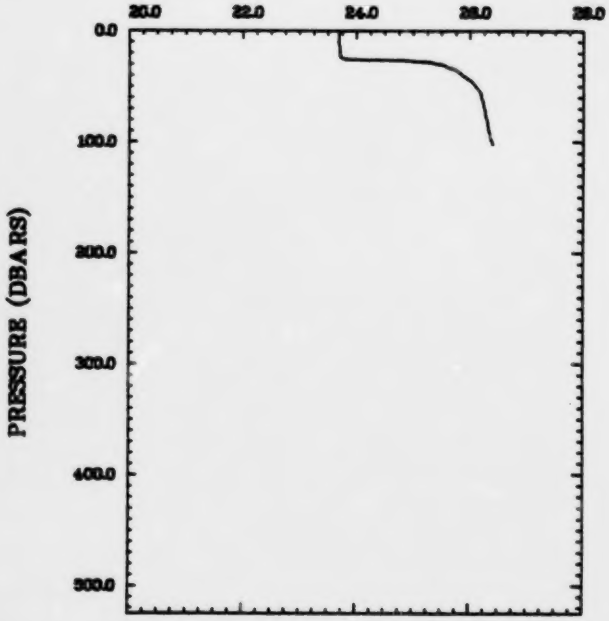
MC2.2 CTD 53 83.10.01
Lat. 69 31.4'N
Lon. 69 21.0'W

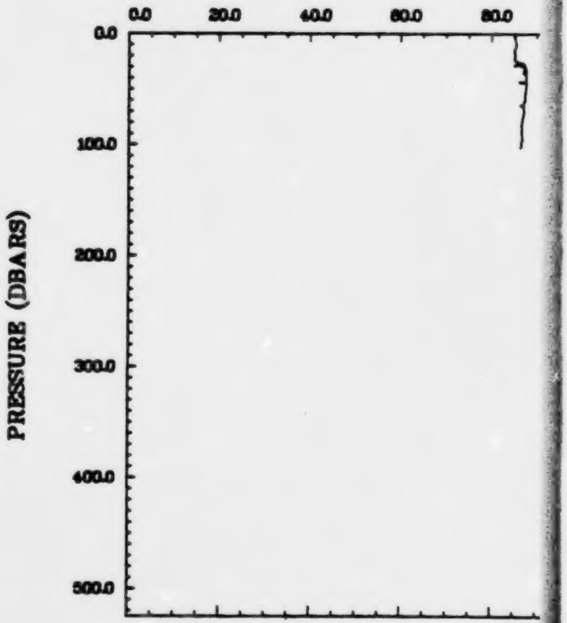


MC2.1 CTD 54 83.10.01
Lat. 69 32.2'N
Lon. 69 27.3'W


TEMPERATURE (DEG. C)

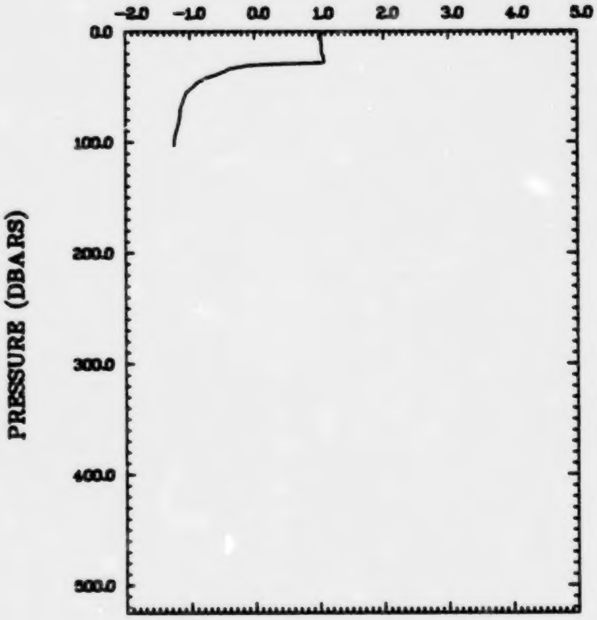

SALINITY (PPT)


SIGMA-THETA (KG/M**3)

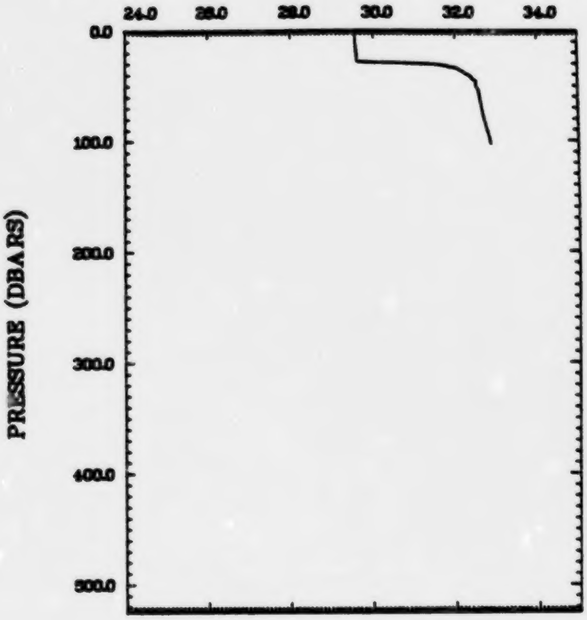

ATTENUANCE (% TRAN)

MC2.0 CTD 55 83.10.01
Lat. 69 33.5'N
Lon. 69 40.2'W

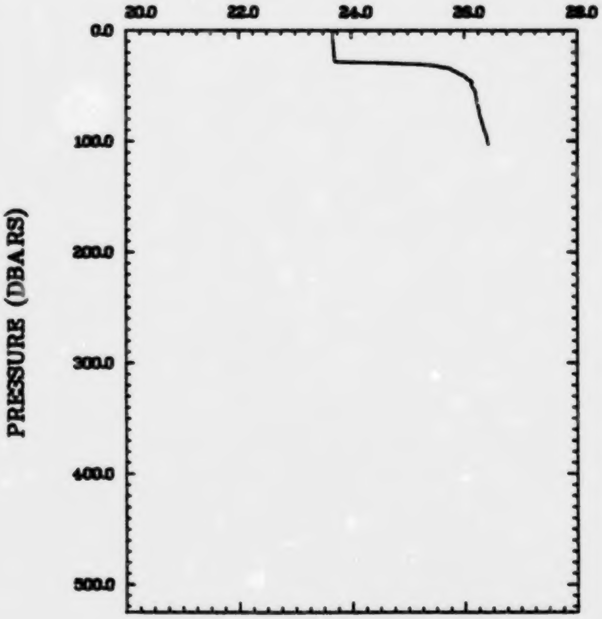
TEMPERATURE (DEG. C)



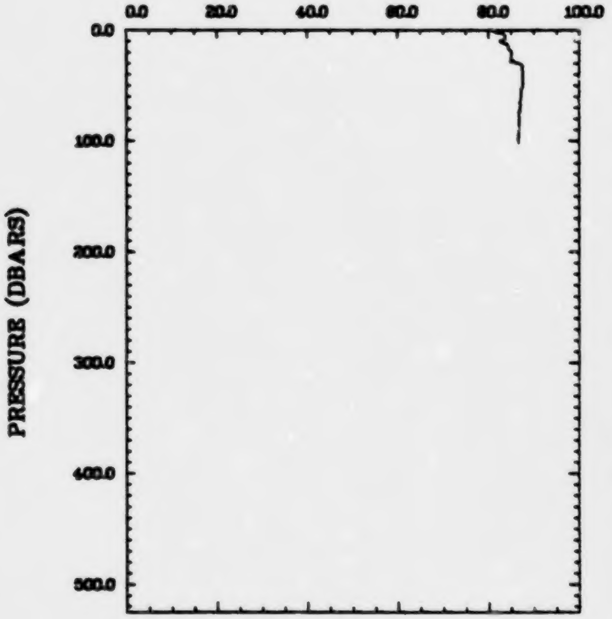
SALINITY (PPT)



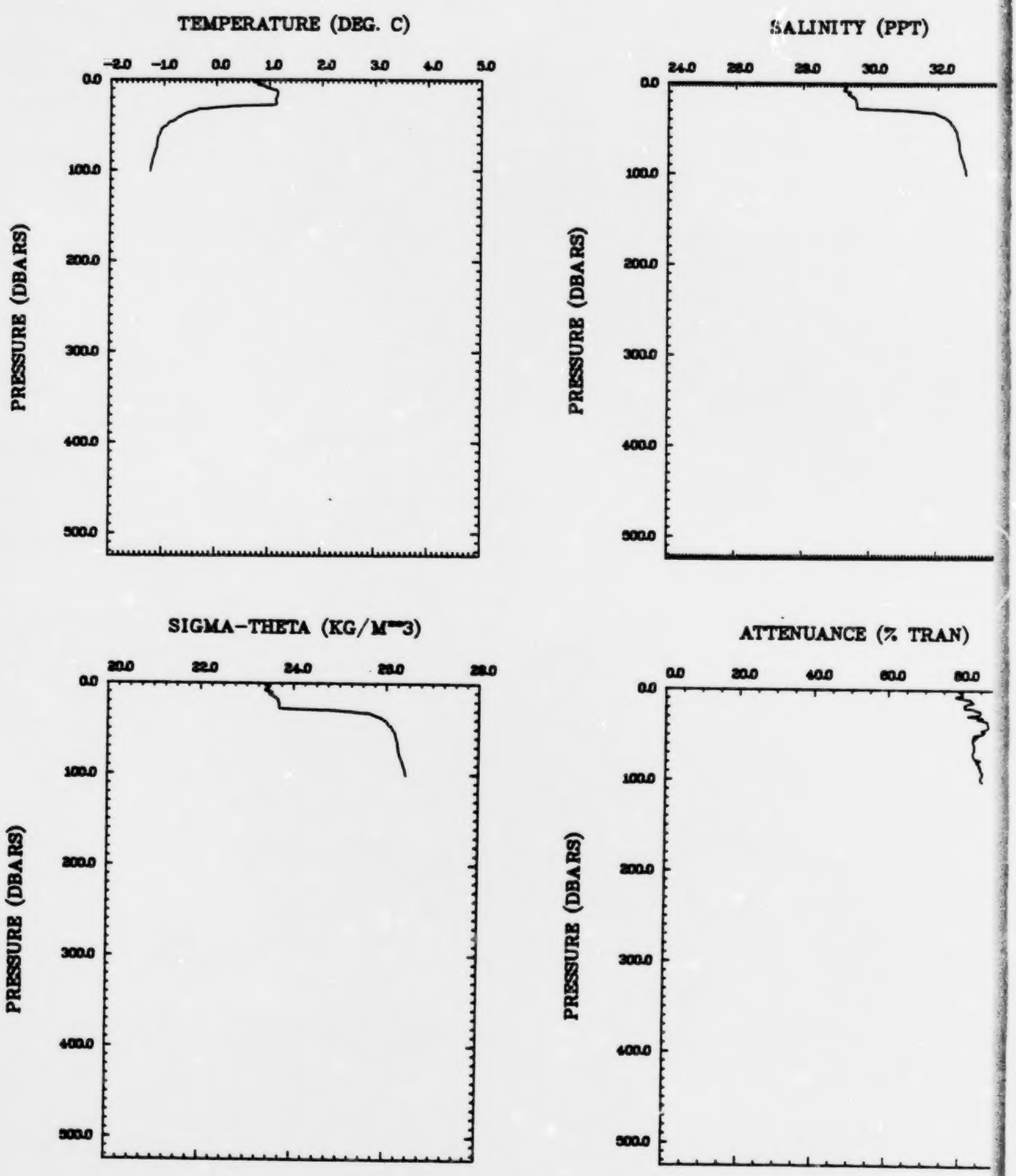
SIGMA-THETA (KG/M**3)



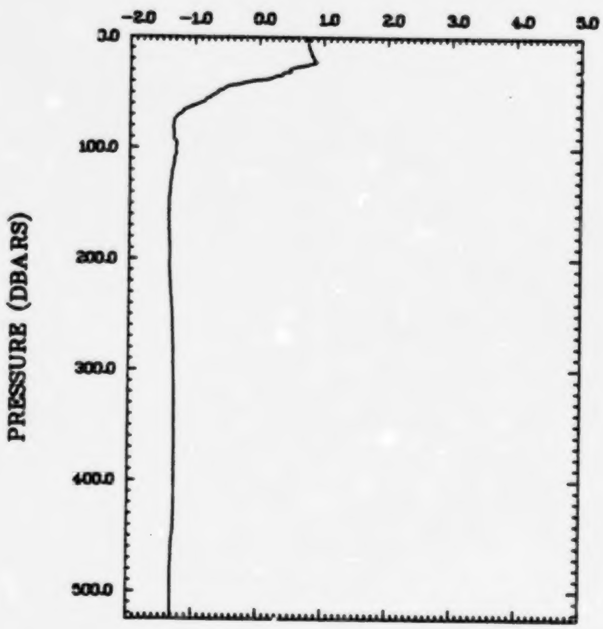
ATTENUANCE (% TRAN)



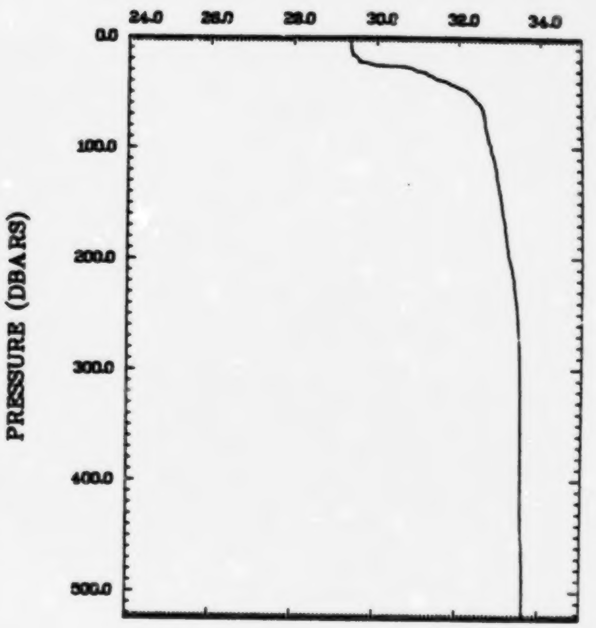
MC0.2 CTD 56 83.10.01
Lat. 69 32.4'N
Lon. 69 50.0'W



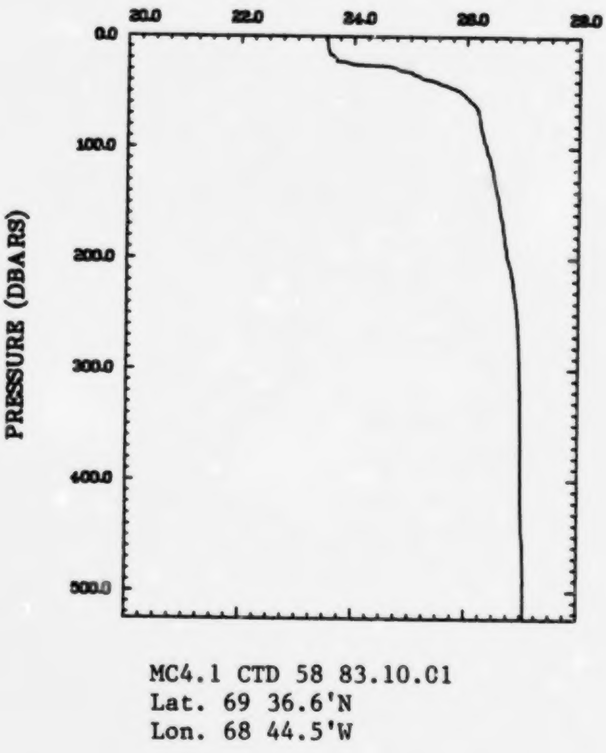
MCO.1 CTD 57 83.10.01
Lat. 69 31.0'N
Lon. 69 57.0'W



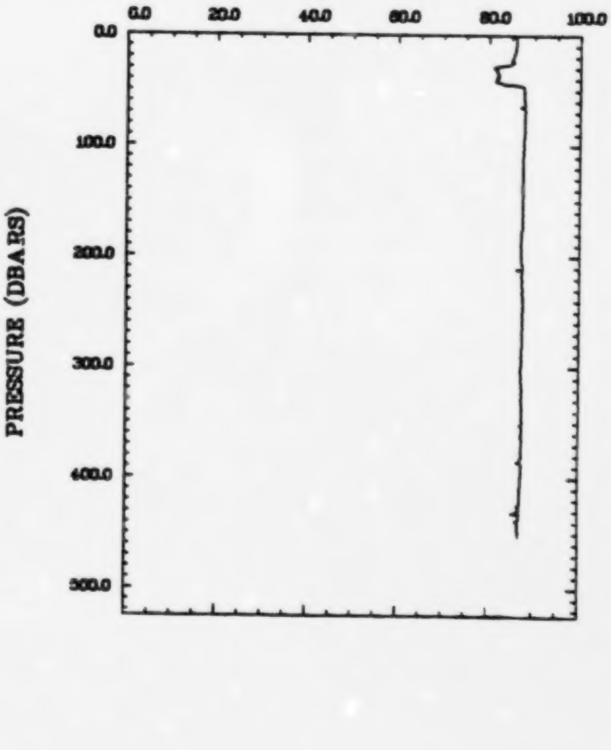
TEMPERATURE (DEG. C)



SALINITY (PPT)

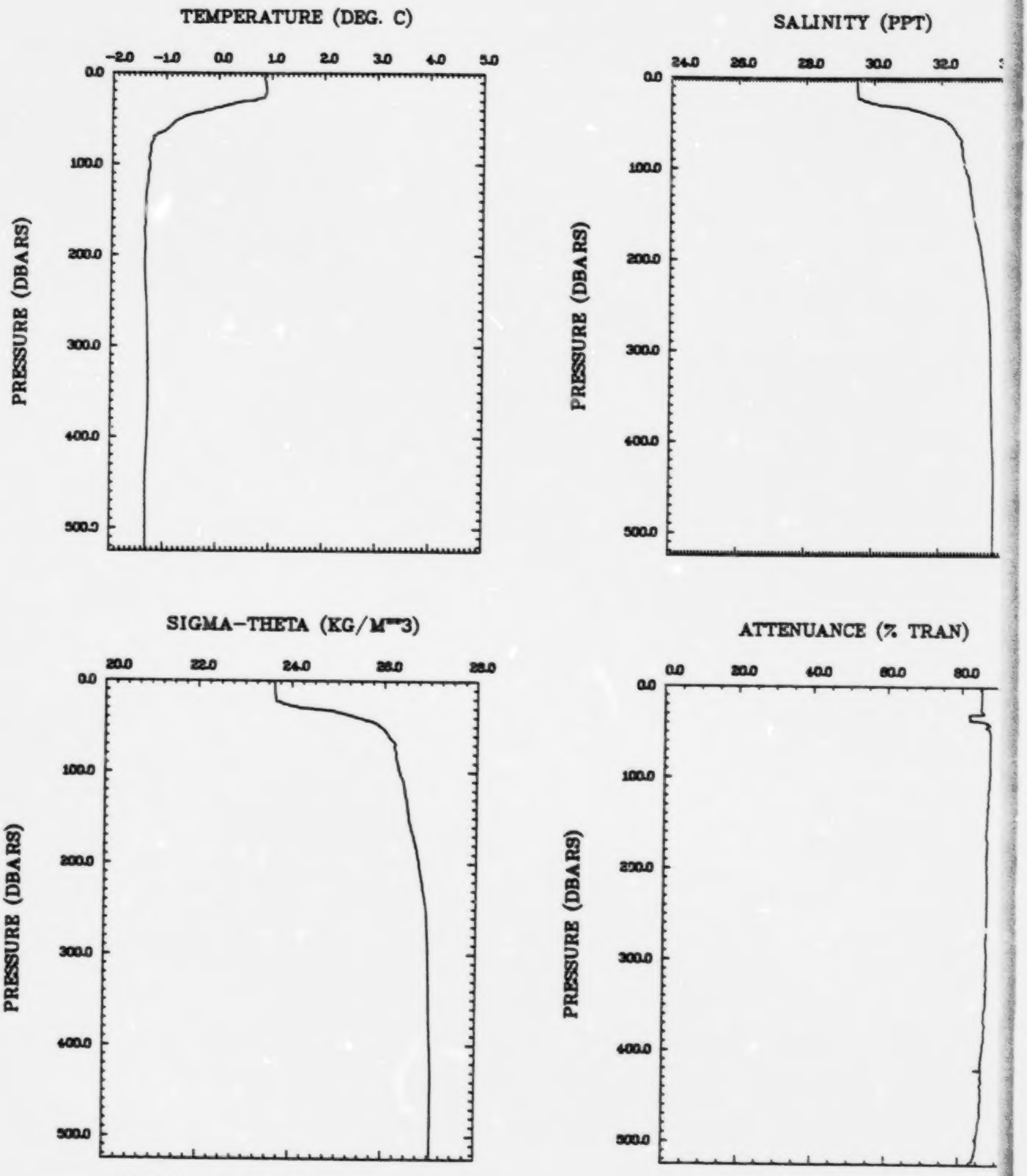


SIGMA-THETA (KG/M**3)



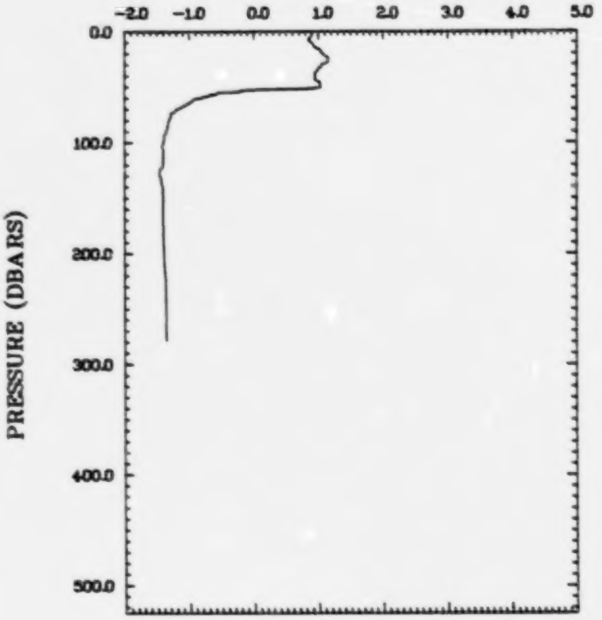
ATTENUANCE (% TRAN)

MC4.1 CTD 58 83.10.01
Lat. 69 36.6'N
Lon. 68 44.5'W

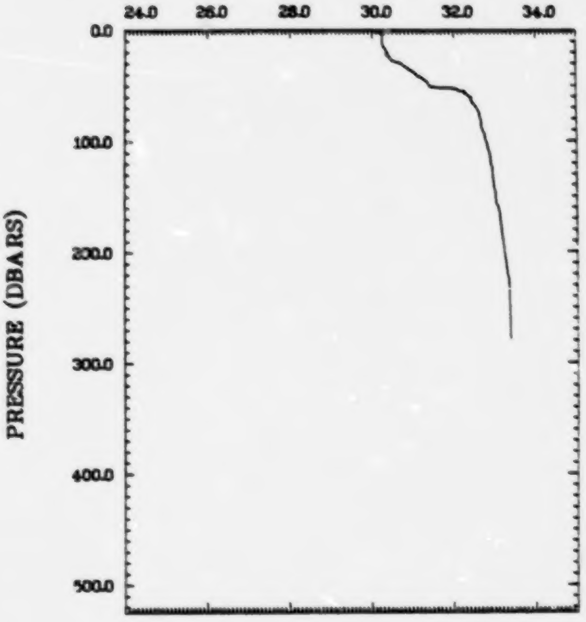


MC3.05 CTD 59 83.10.01
Lat. 69 33.5'N
Lon. 69 1.0'W

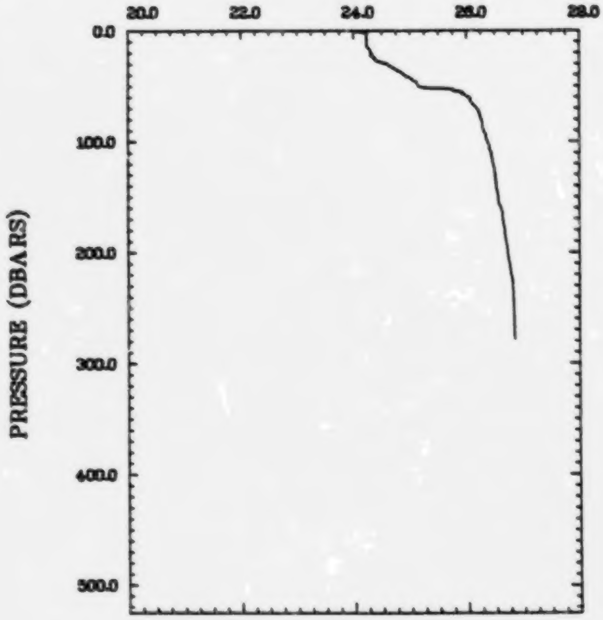
TEMPERATURE (DEG. C)



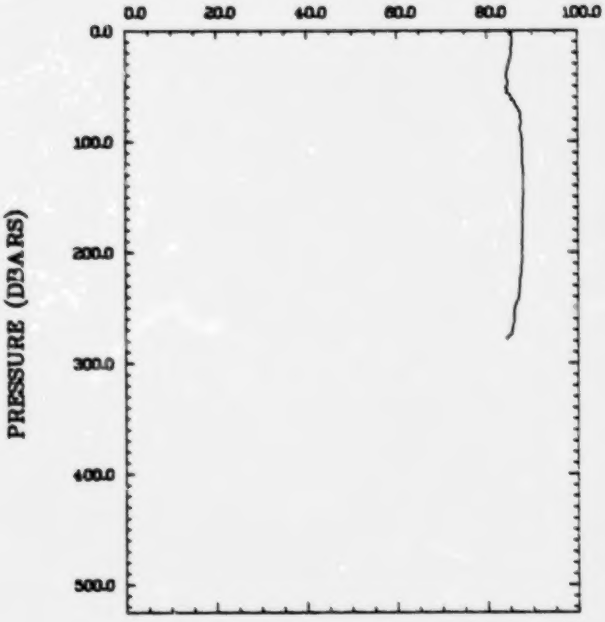
SALINITY (PPT)



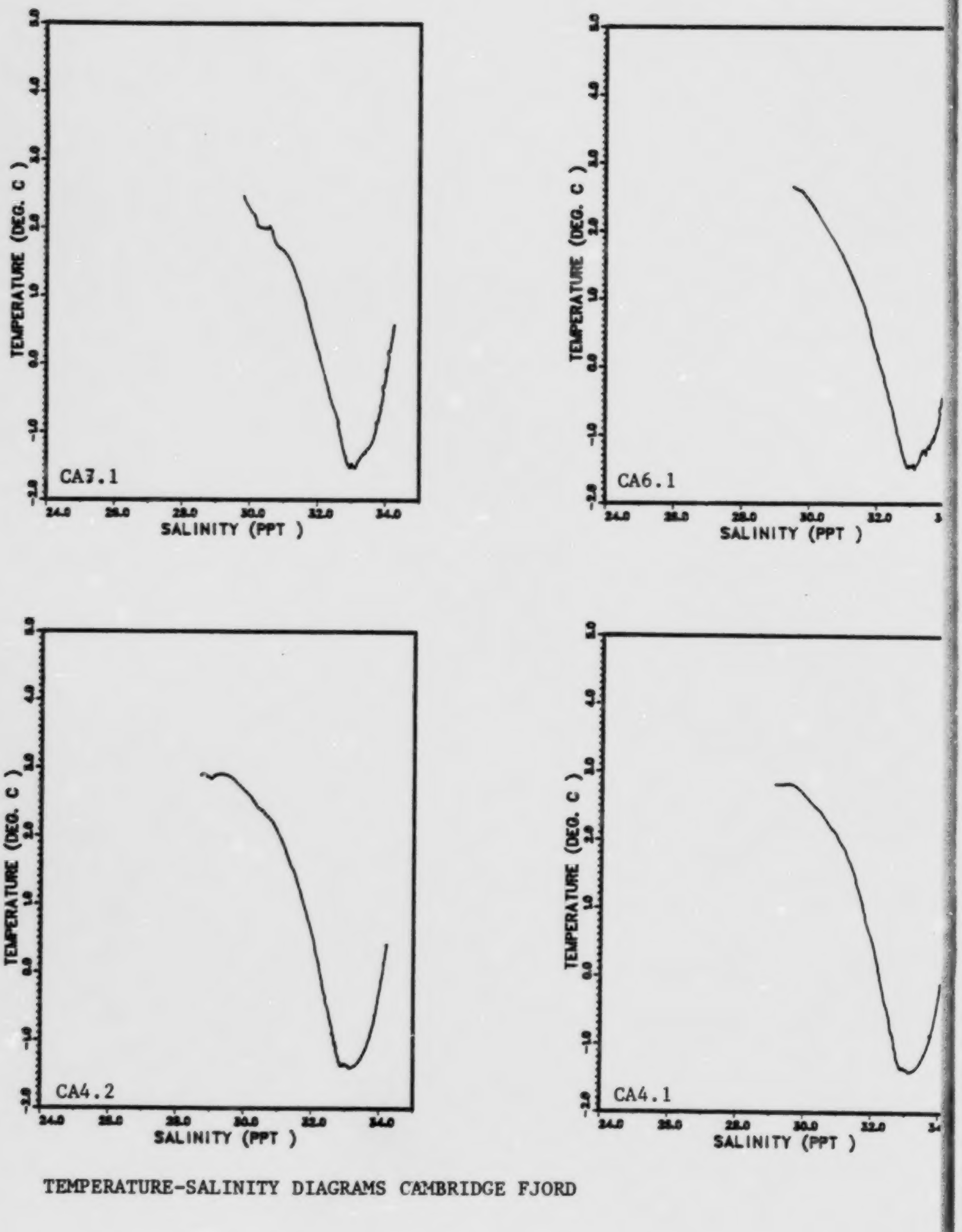
SIGMA-THETA (KG/M**3)



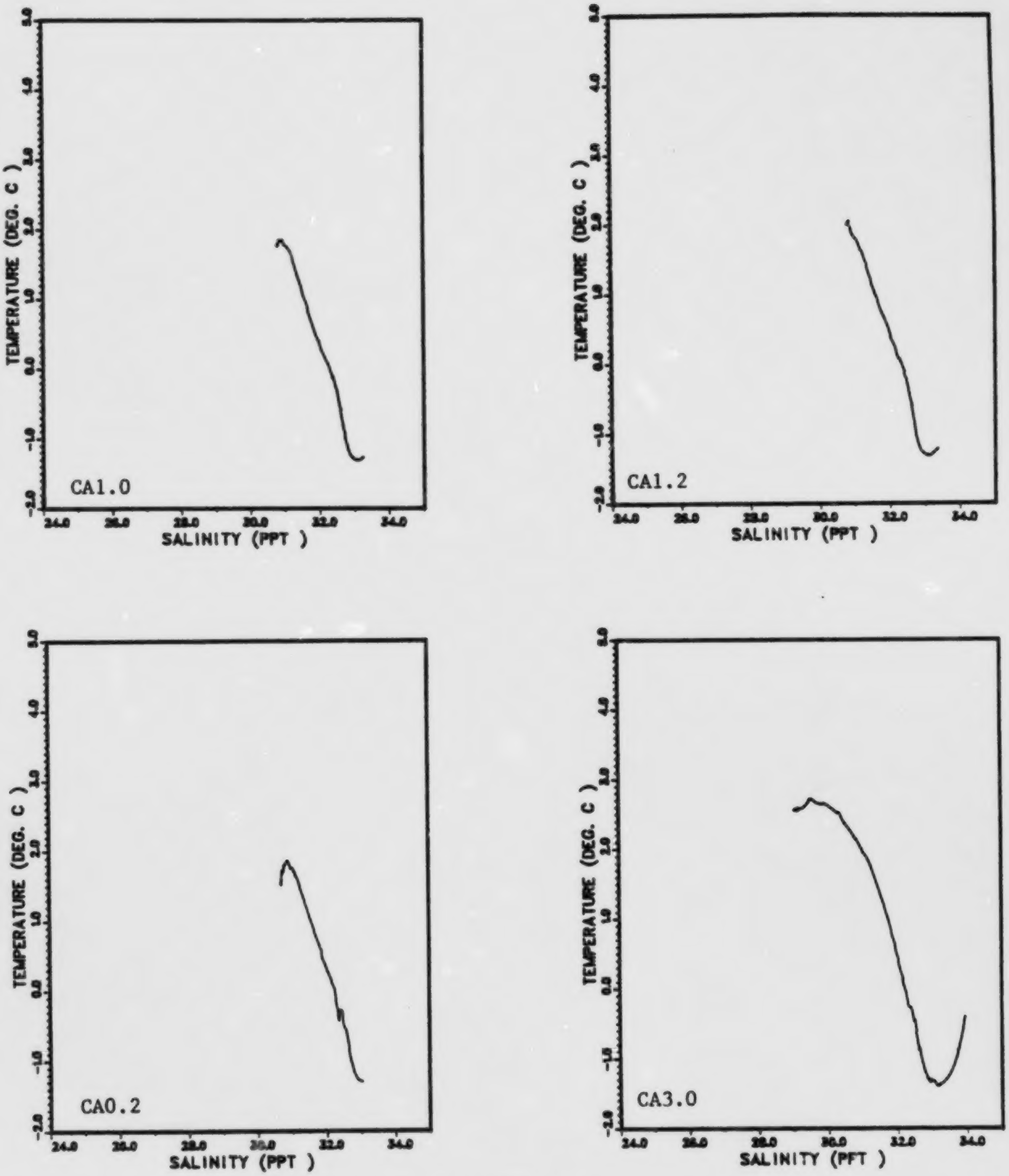
ATTENUANCE (% TRAN)



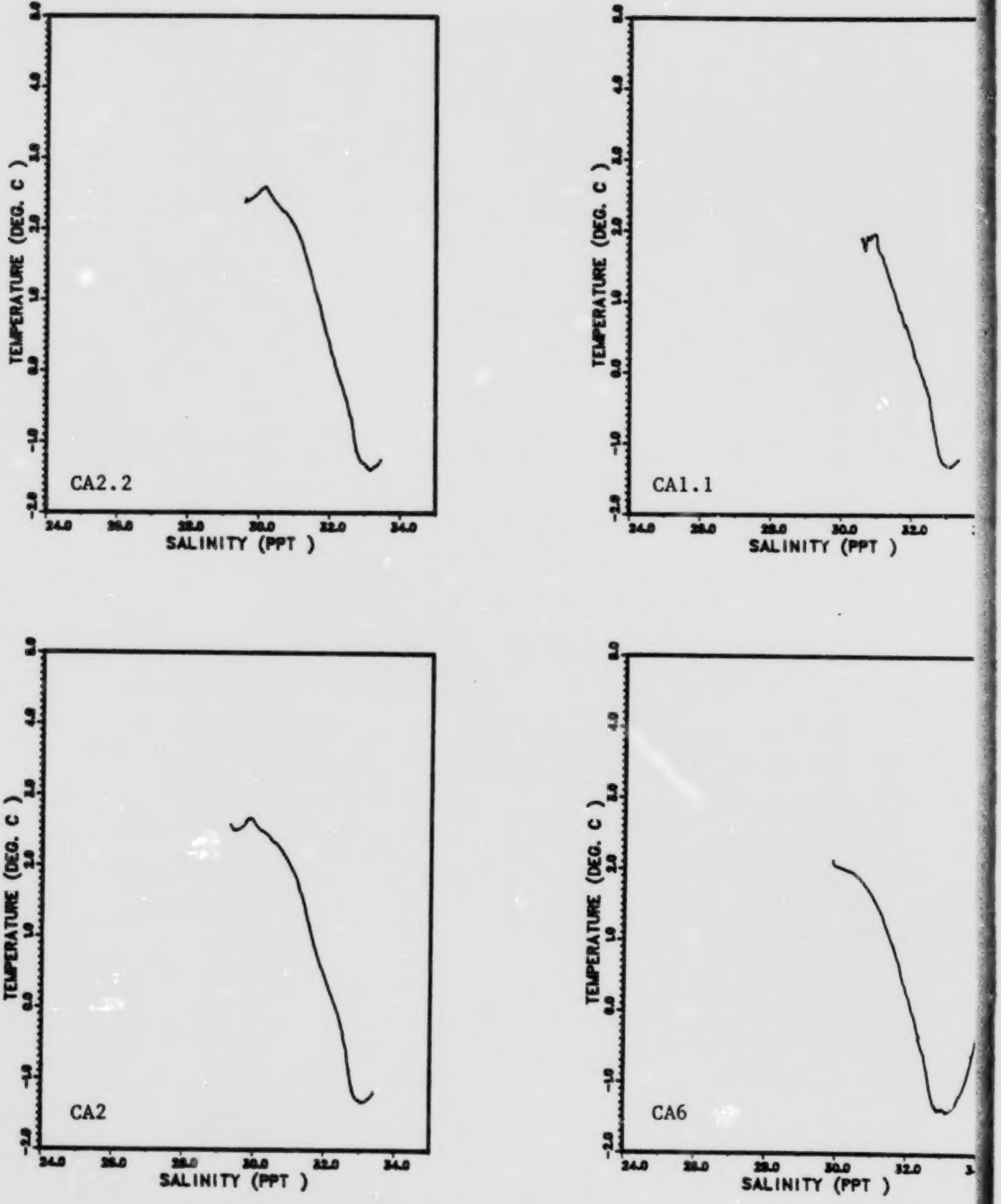
MC10 CTD 60 83.10.02
Lat. 69 36.3'N
Lon. 67 20.0'W



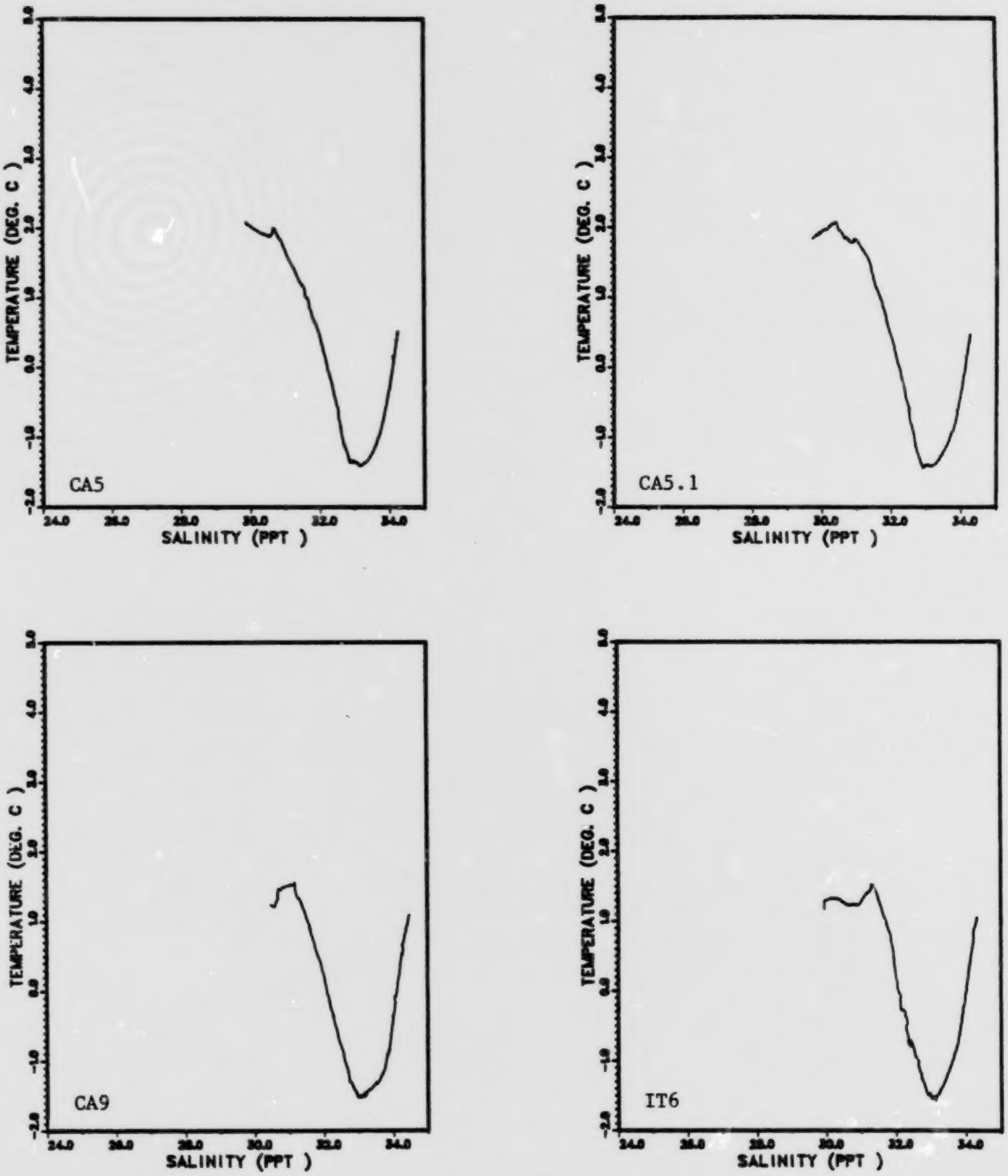
TEMPERATURE-SALINITY DIAGRAMS CAMBRIDGE FJORD



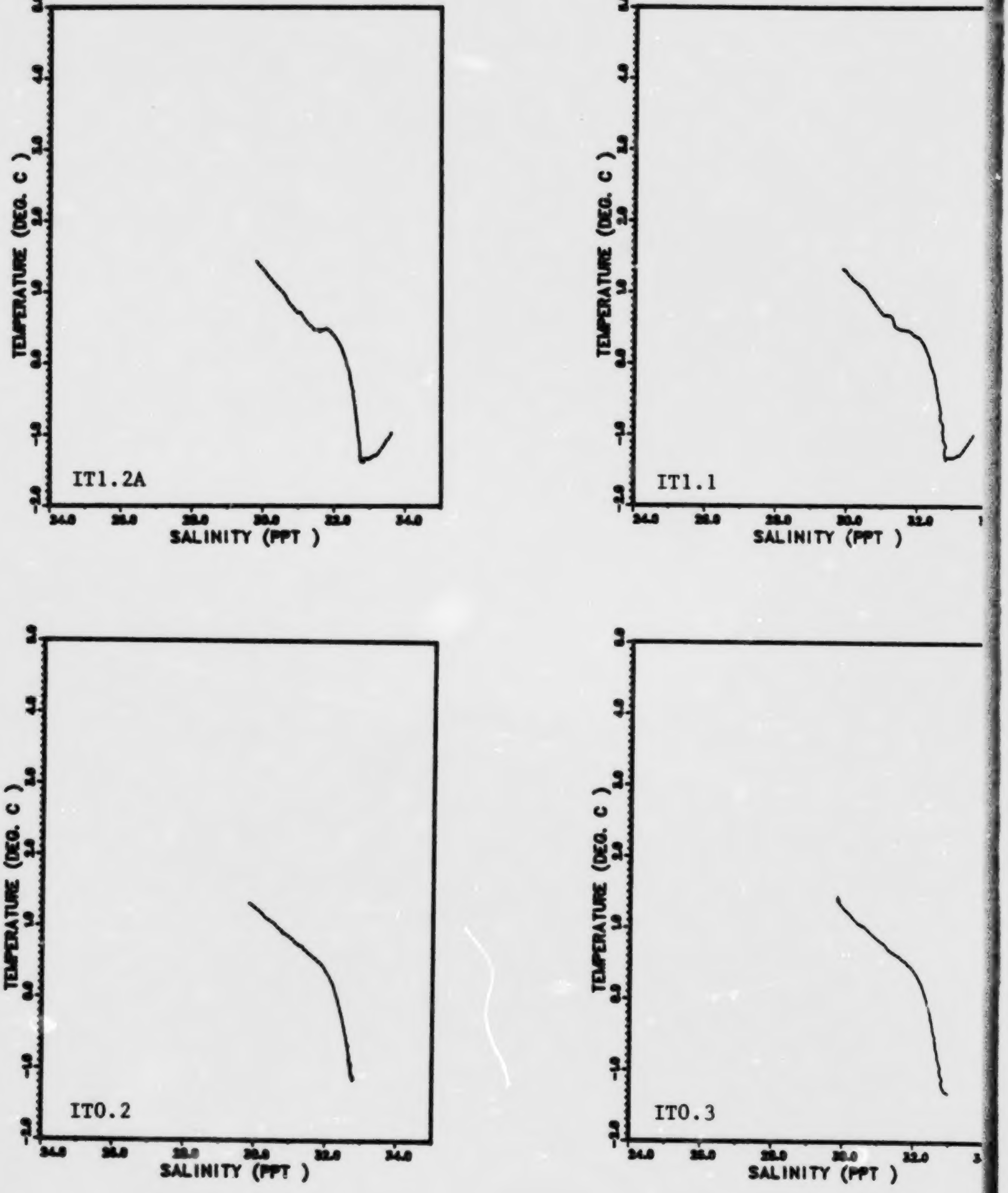
TEMPERATURE-SALINITY DIAGRAMS CAMBRIDGE FJORD



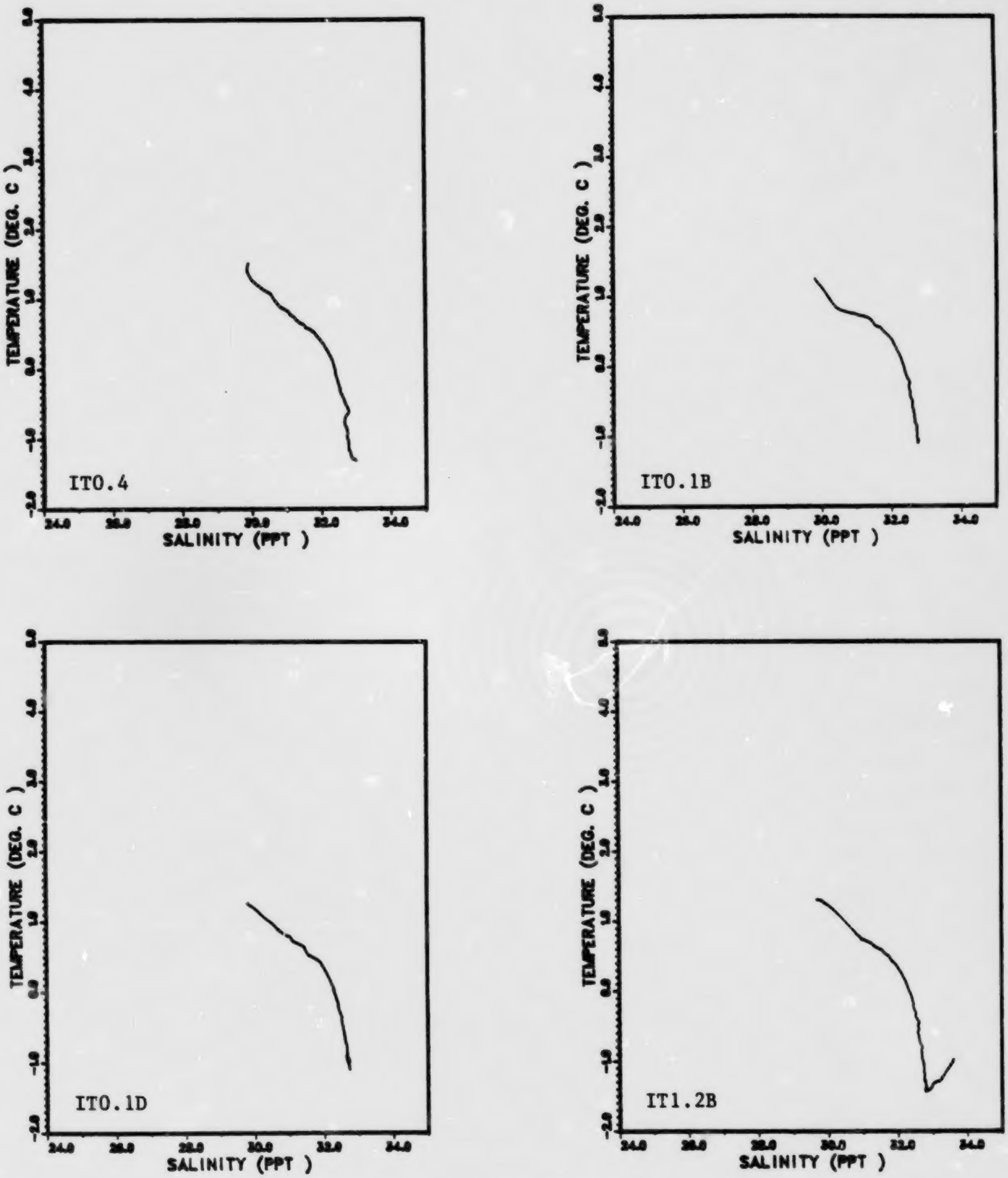
TEMPERATURE-SALINITY DIAGRAMS CAMBRIDGE FJORD



TEMPERATURE-SALINITY DIAGRAMS CAMBRIDGE,ITERBILUNG FJORDS



TEMPERATURE-SALINITY DIAGRAMS ITERBILUNG FJORD



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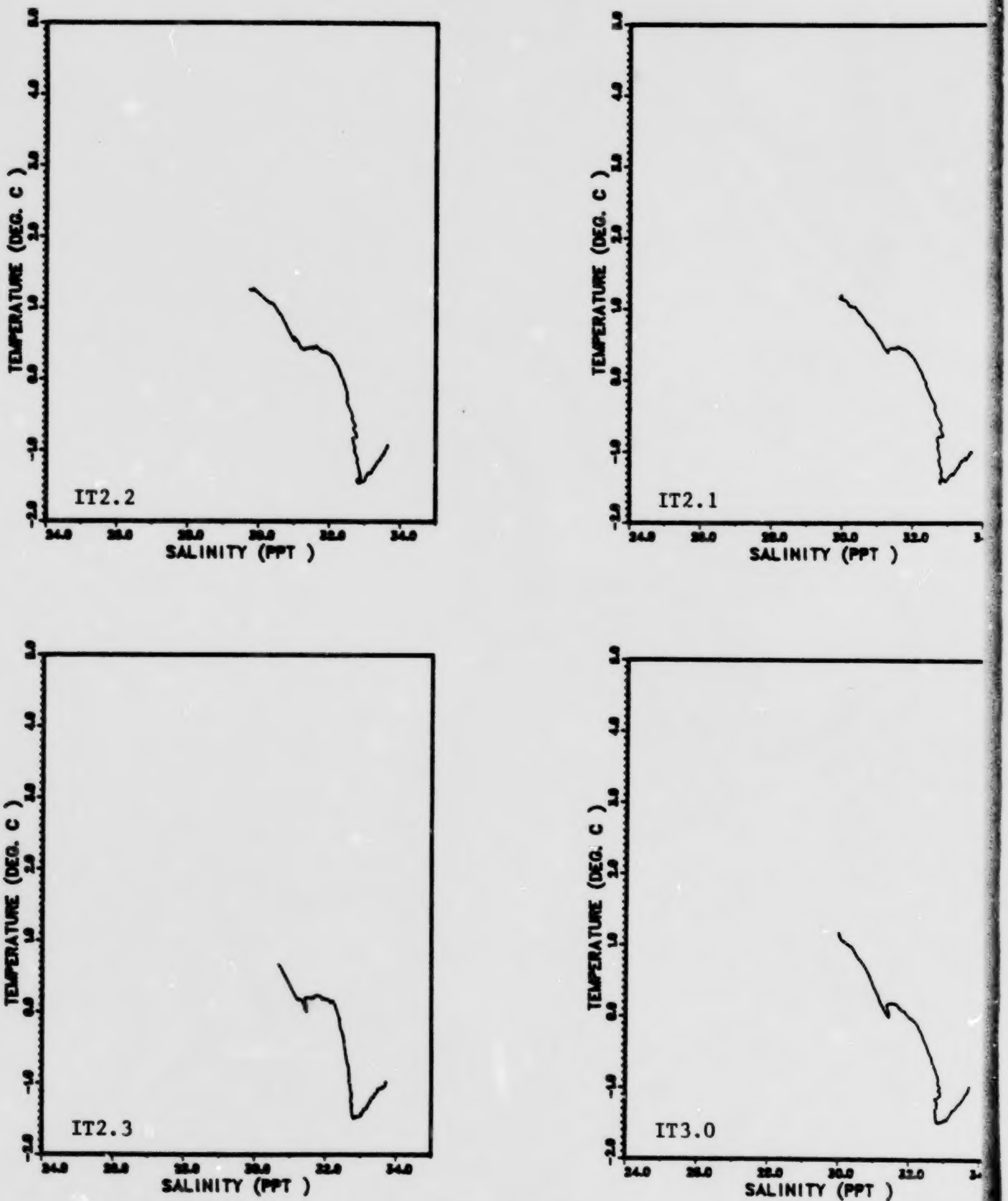

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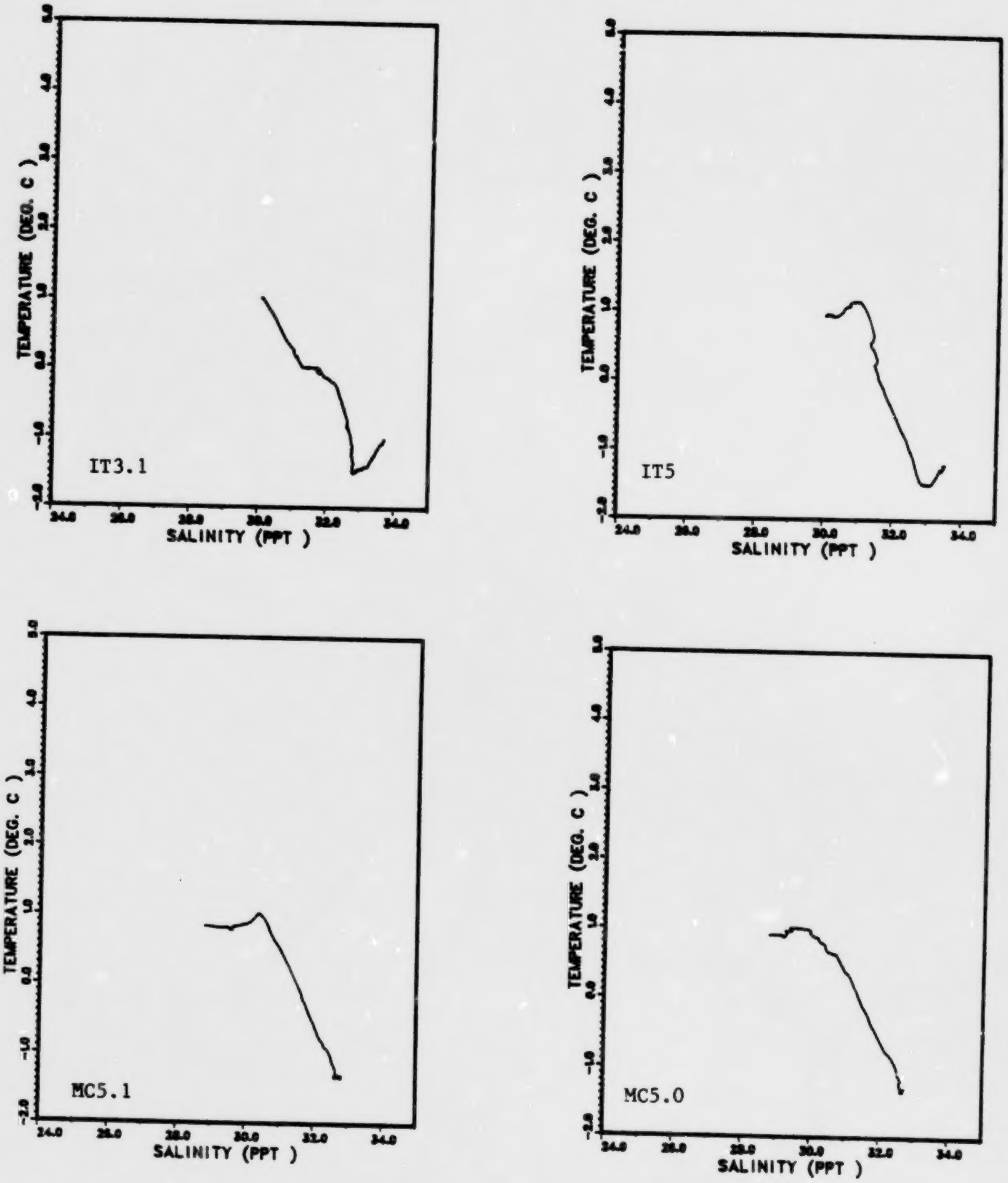
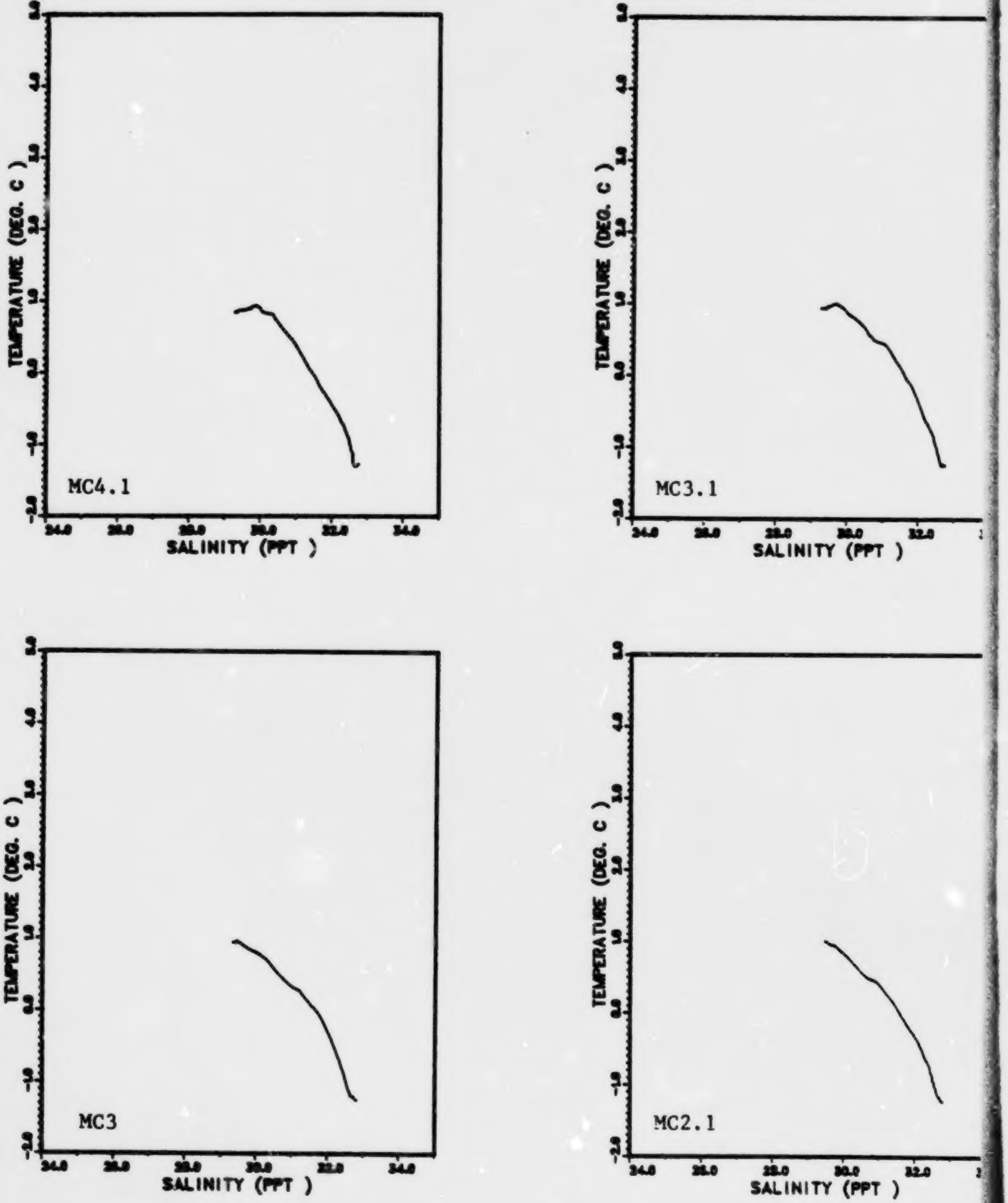
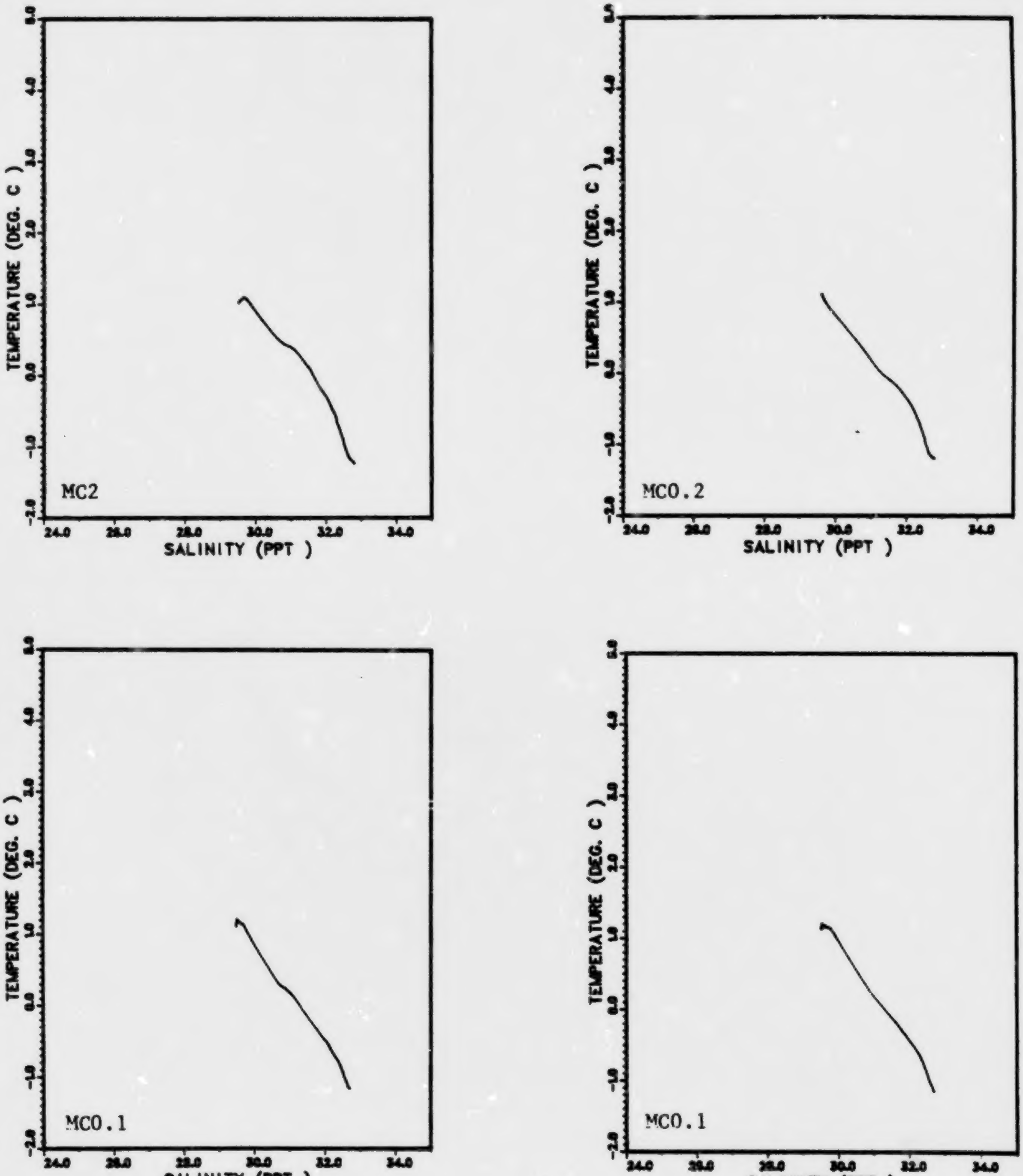


TEMPERATURE-SALINITY DIAGRAMS ITERBILUNG,MCBETH FJORDS



TEMPERATURE-SALINITY DIAGRAMS MCBETH FJORD



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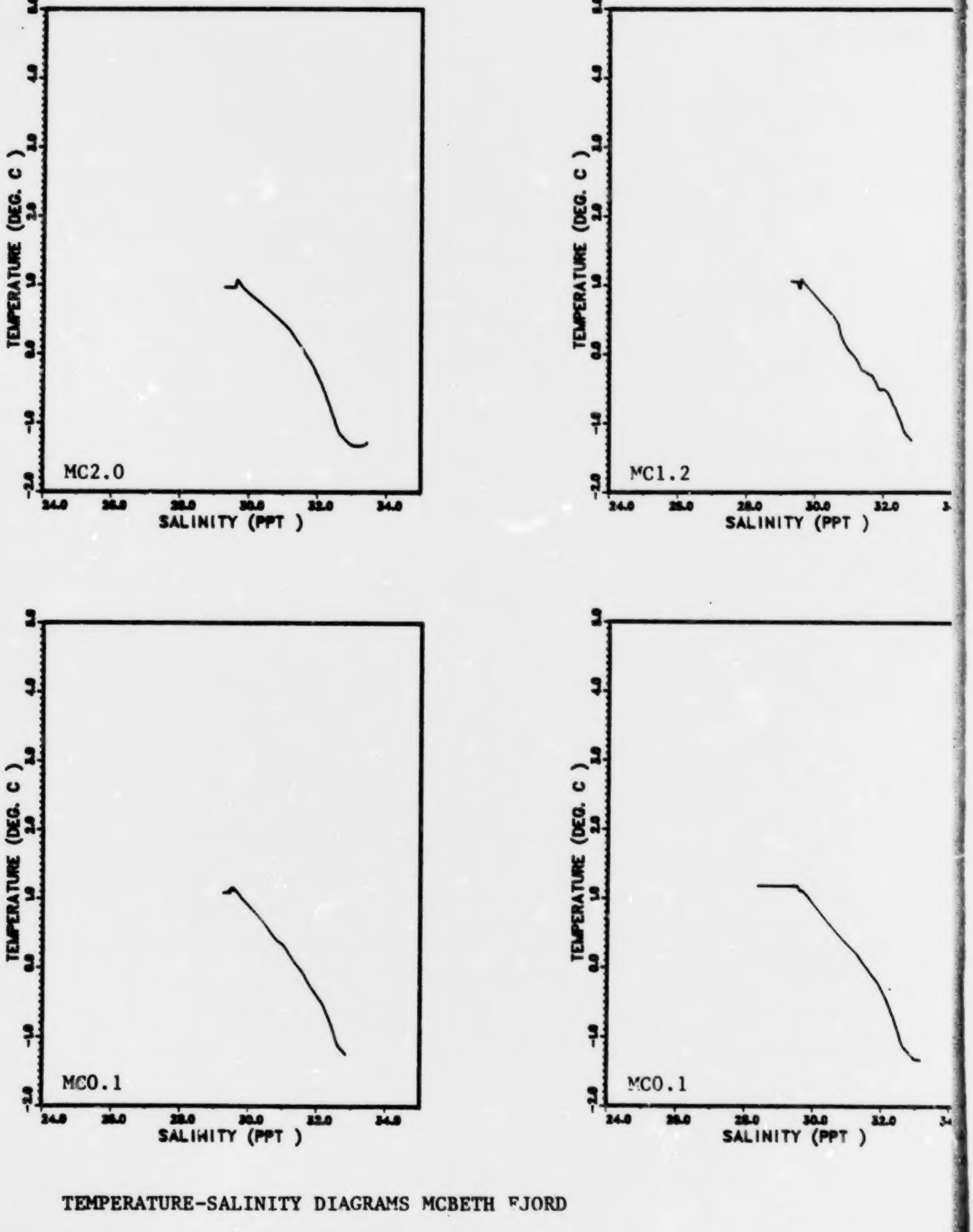

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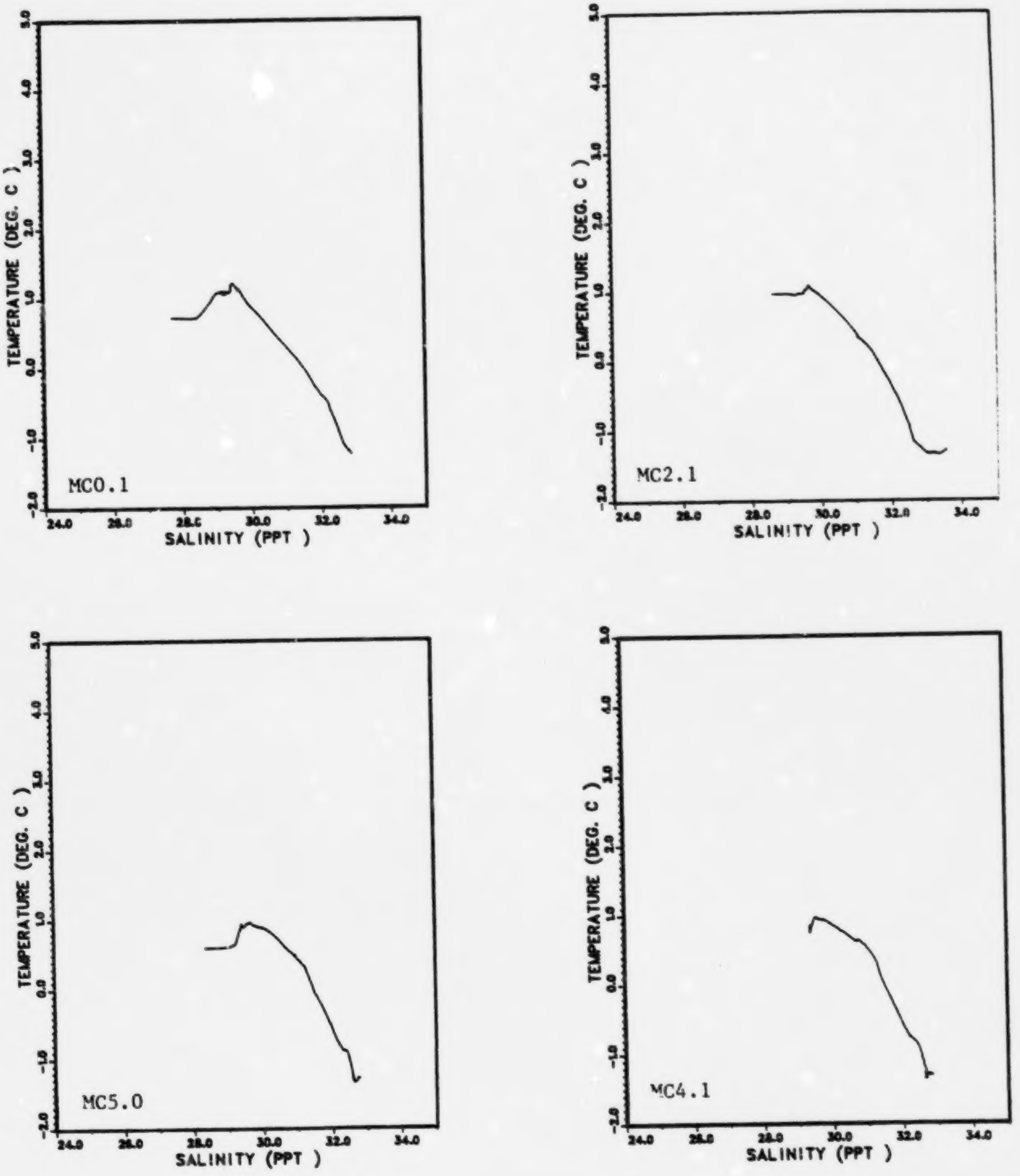
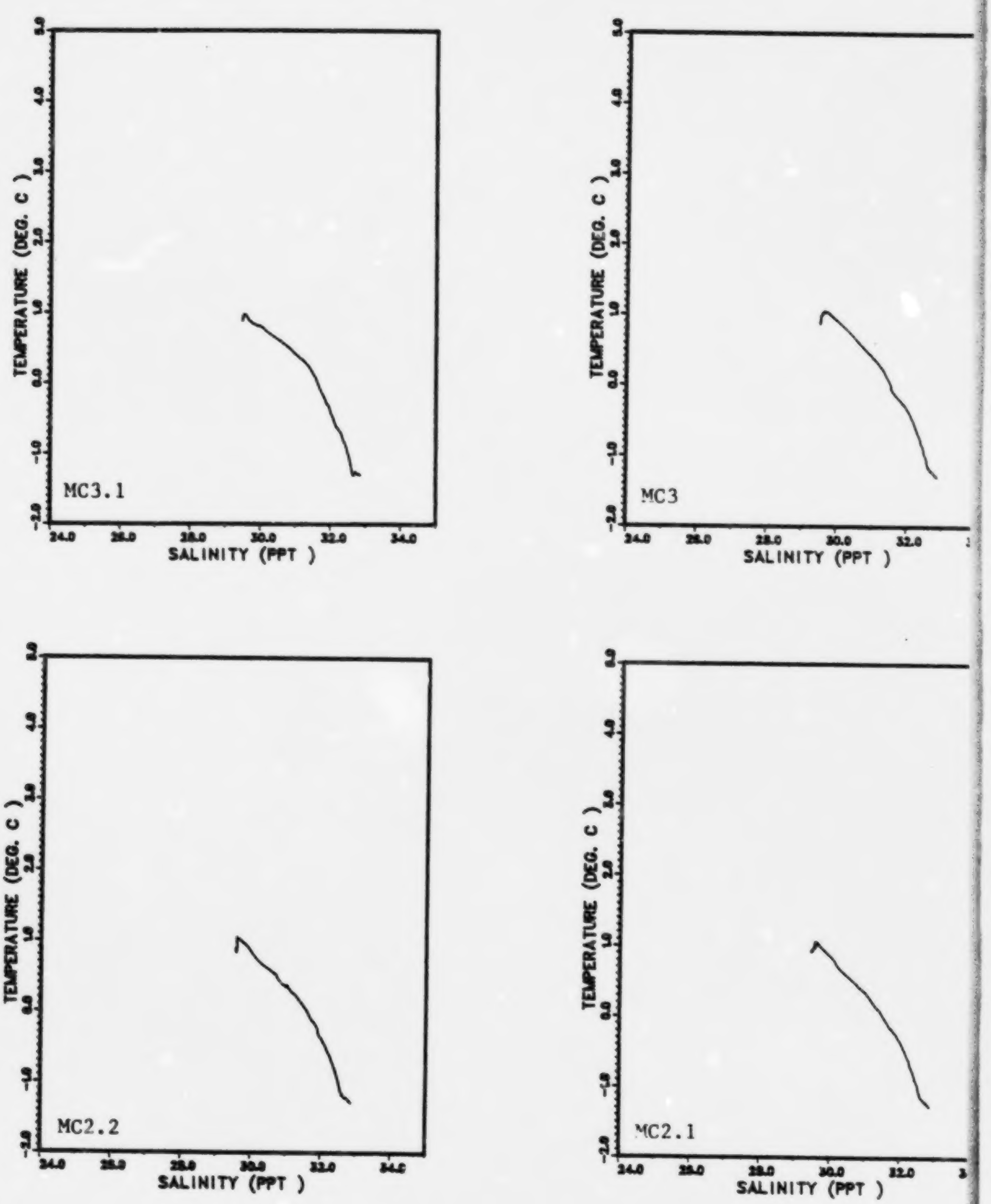


TEMPERATURE-SALINITY DIAGRAMS MCBETH FJORD



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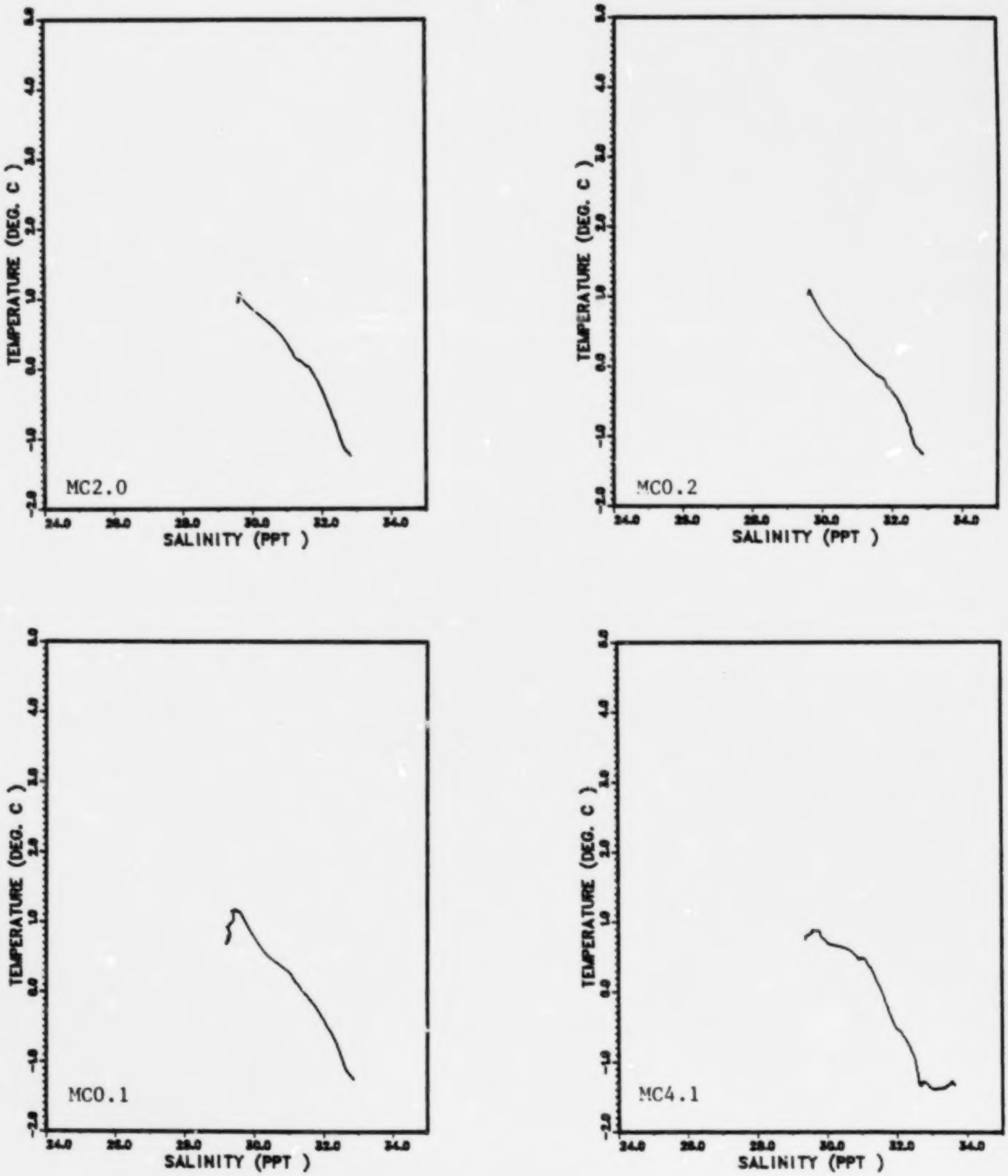
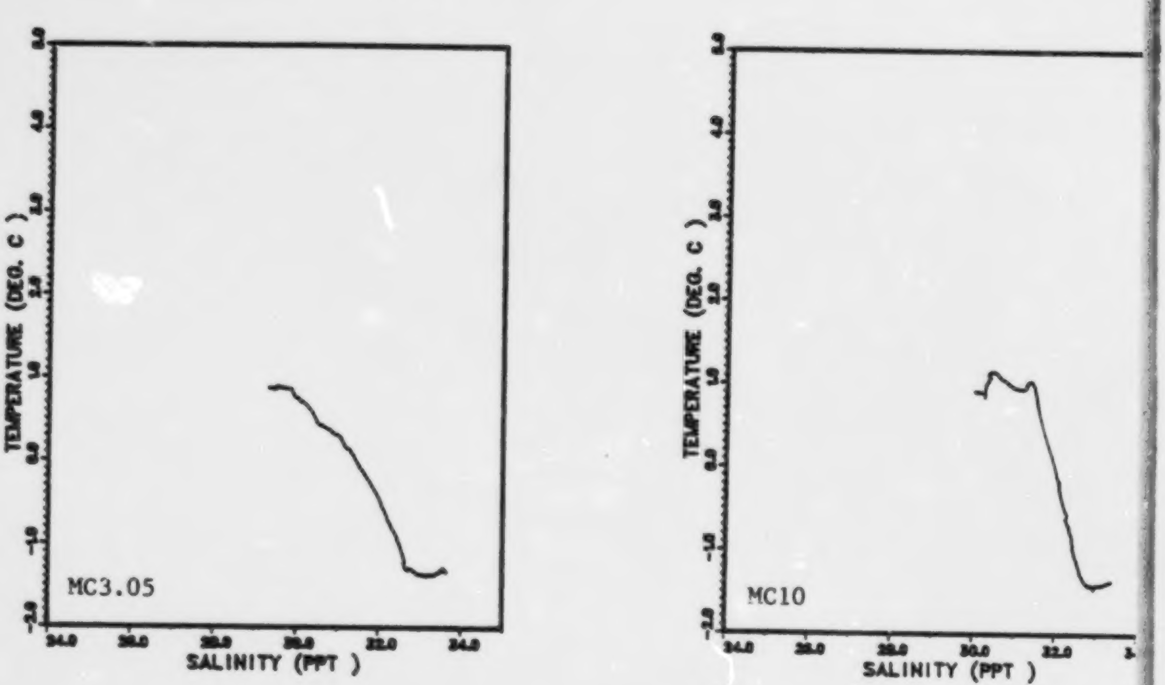
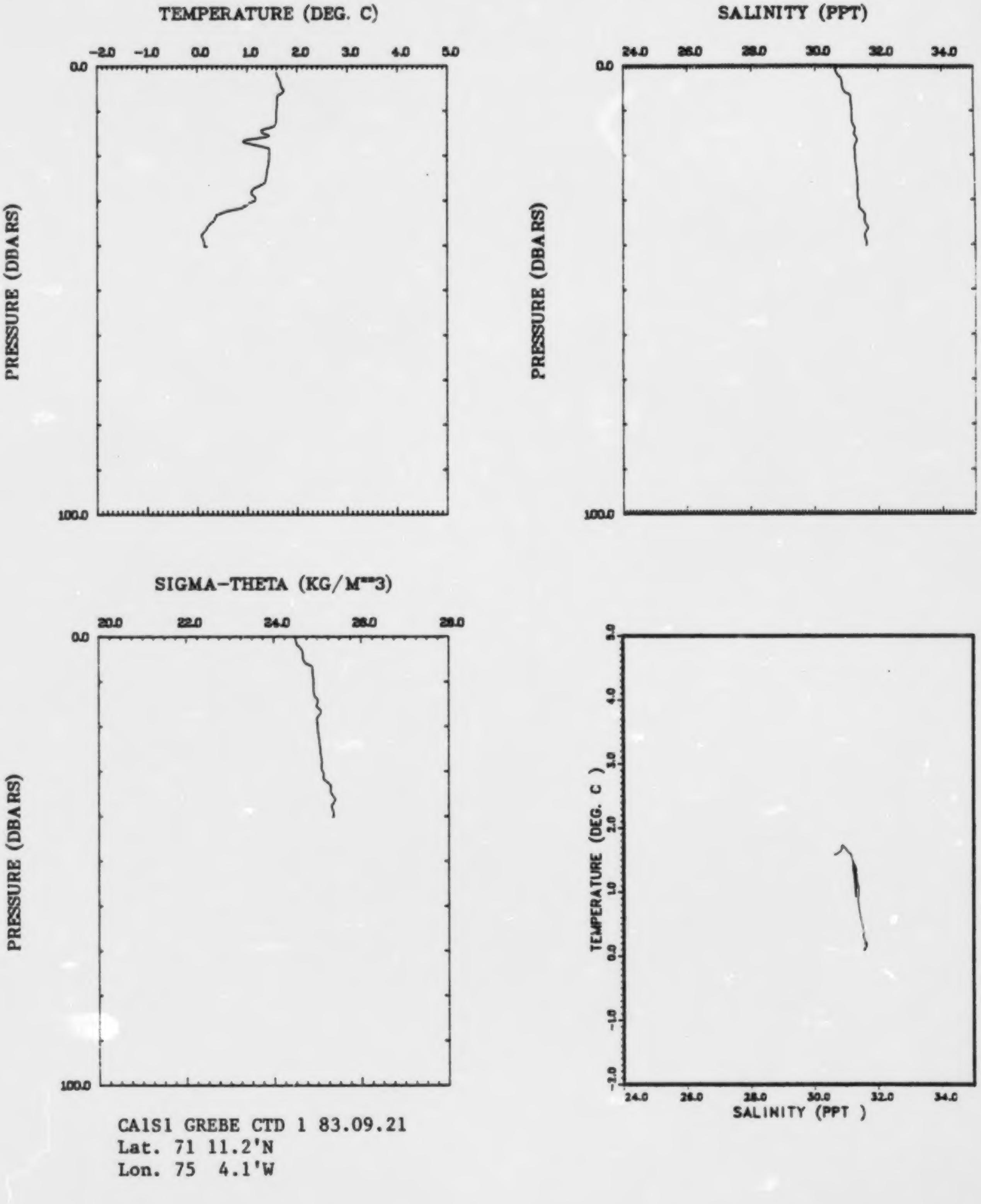


TEMPERATURE-SALINITY DIAGRAMS MCBETH FJORD



TEMPERATURE-SALINITY DIAGRAMS MCBETH FJORD

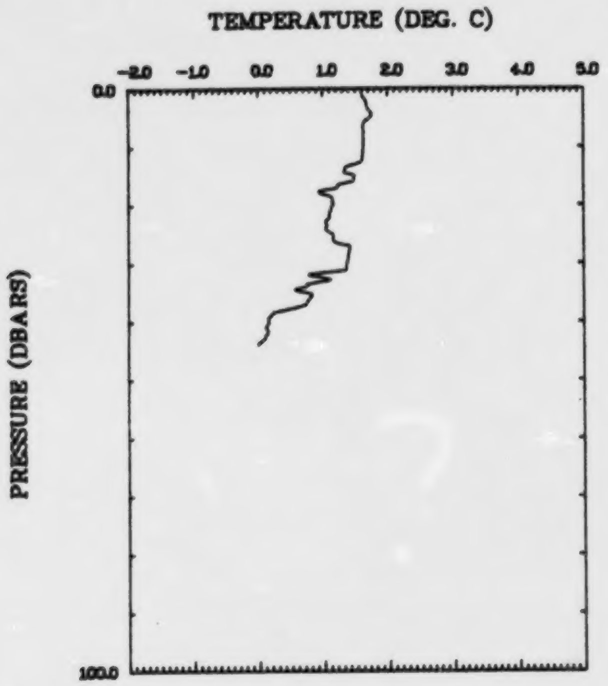


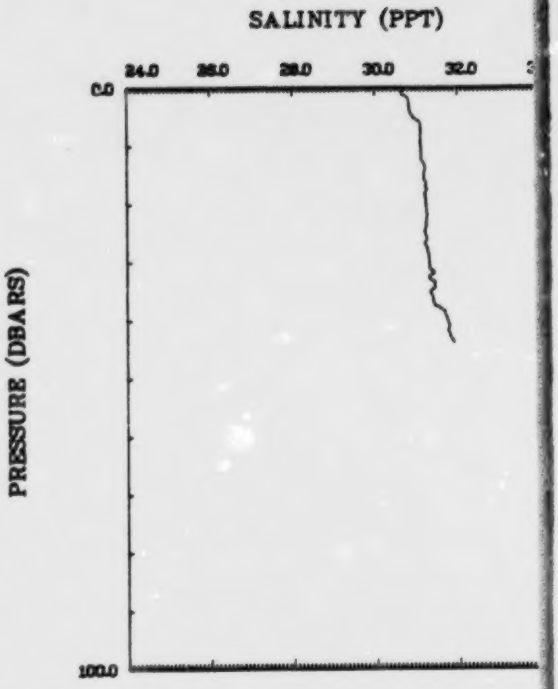
TEMPERATURE (DEG. C)

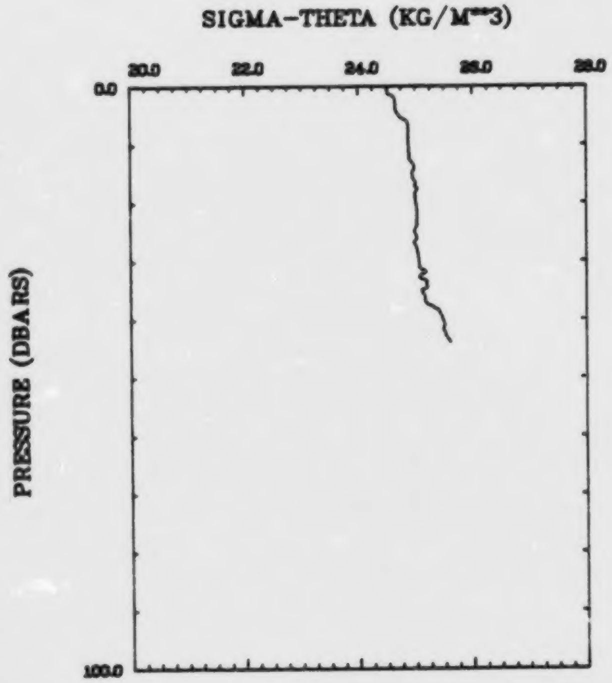
SALINITY (PPT)

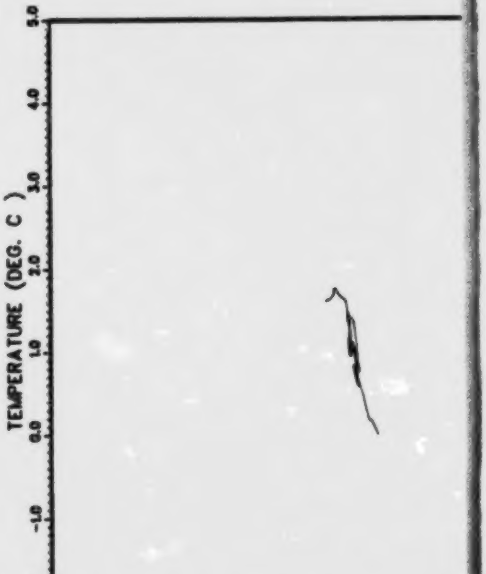
SIGMA-THETA (KG/M**3)

CA1S1 GREBE CTD 1 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

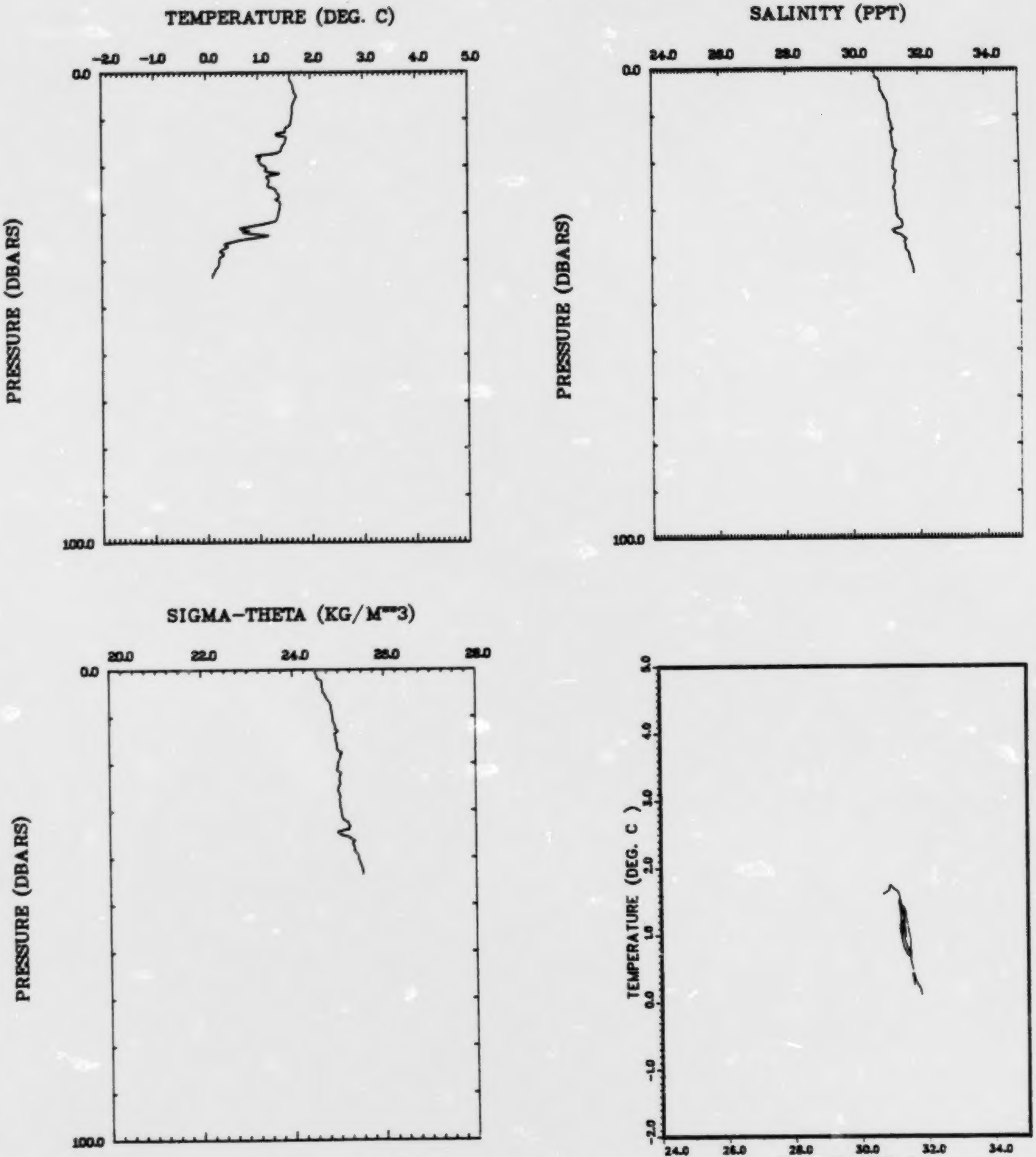

TEMPERATURE (DEG. C)


SALINITY (PPT)

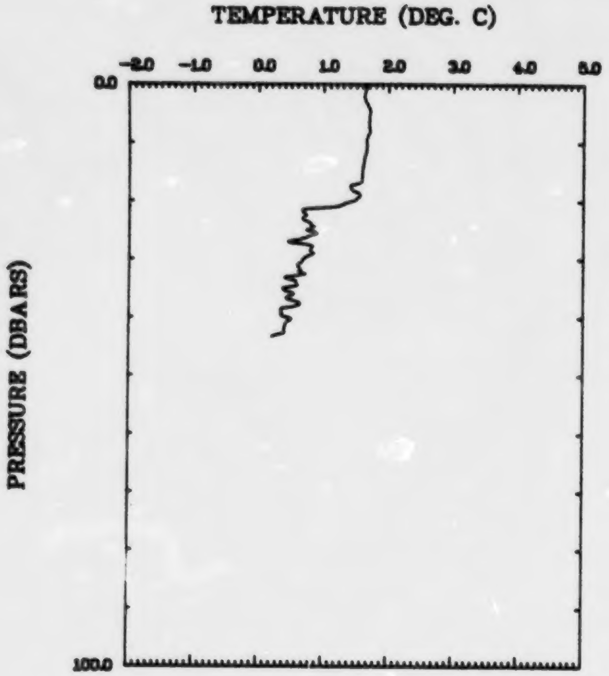

SIGMA-THETA (KG/M**3)

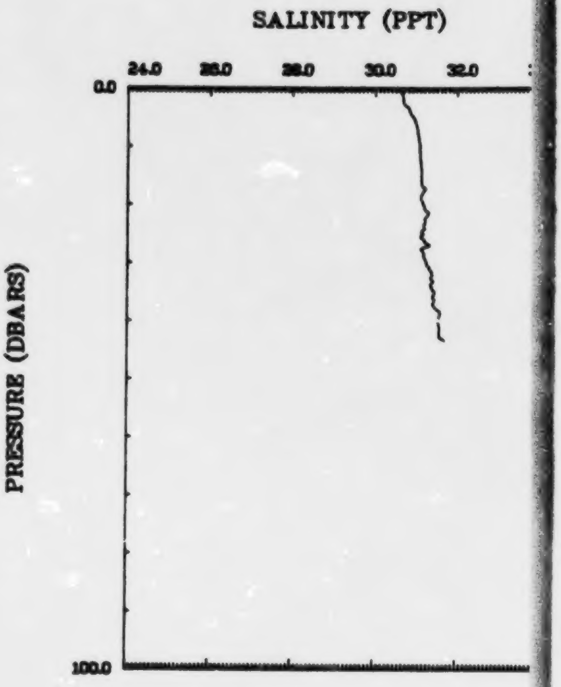


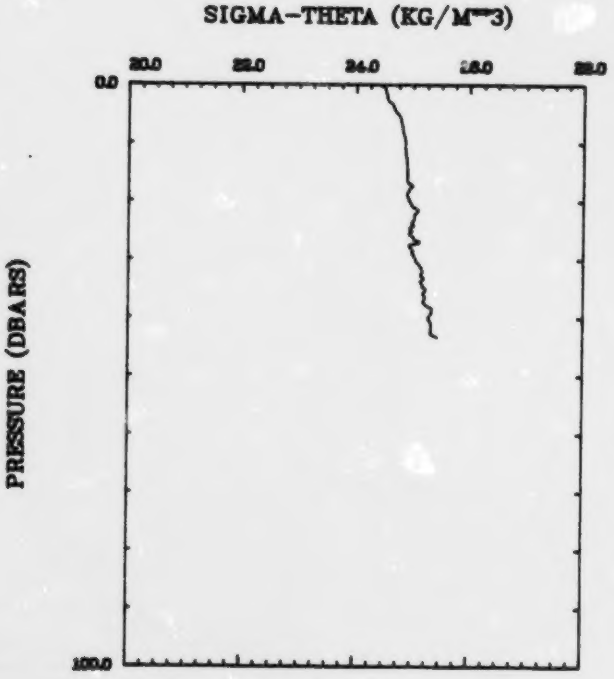
CA1S2 GREBE CTD 2 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

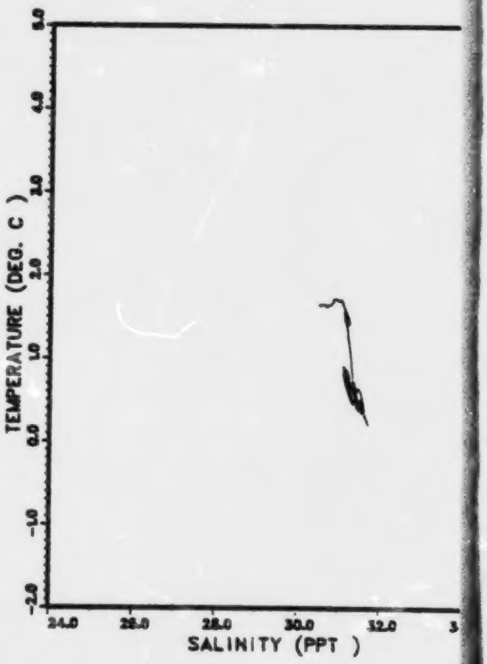


CA1S3 GREBE CTD 3 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

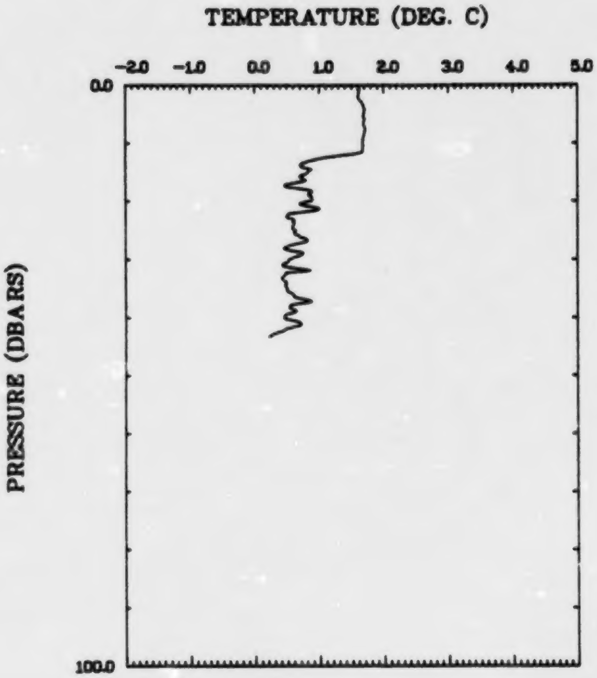


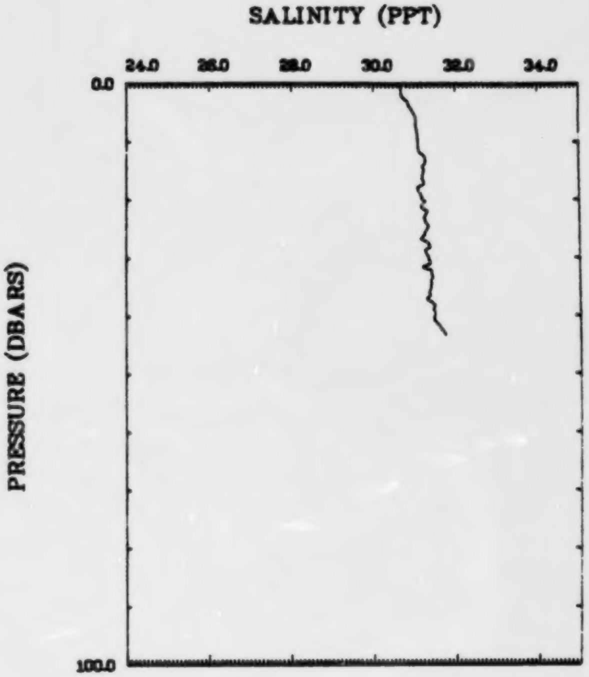


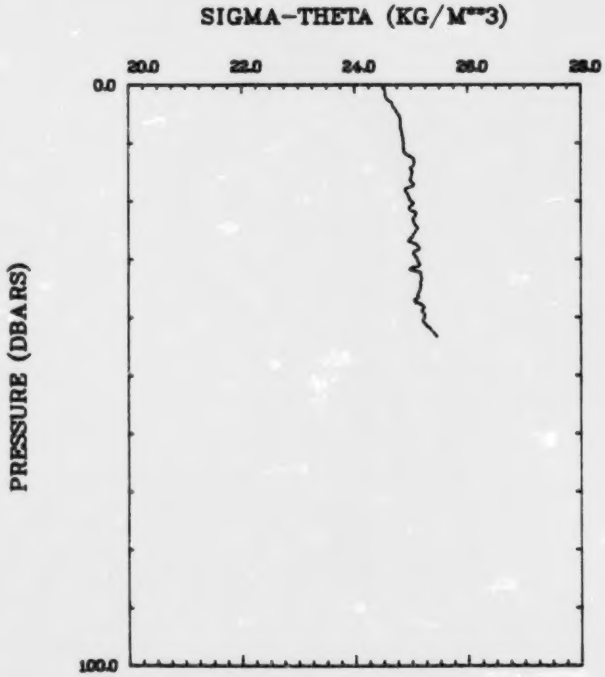


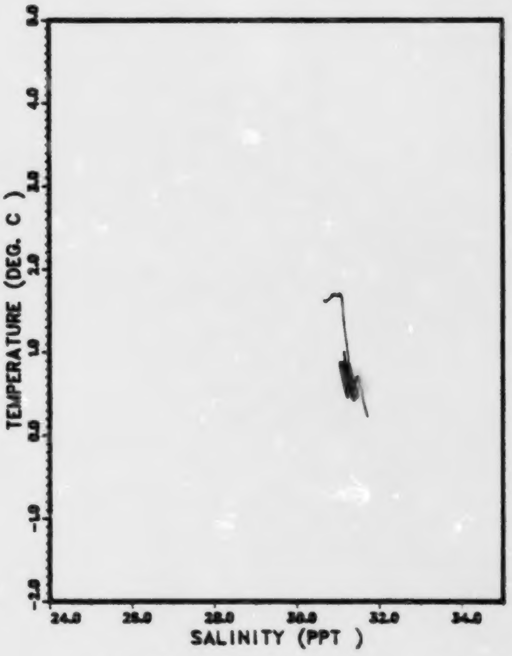


CA1S4 GREBE CTD 4 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

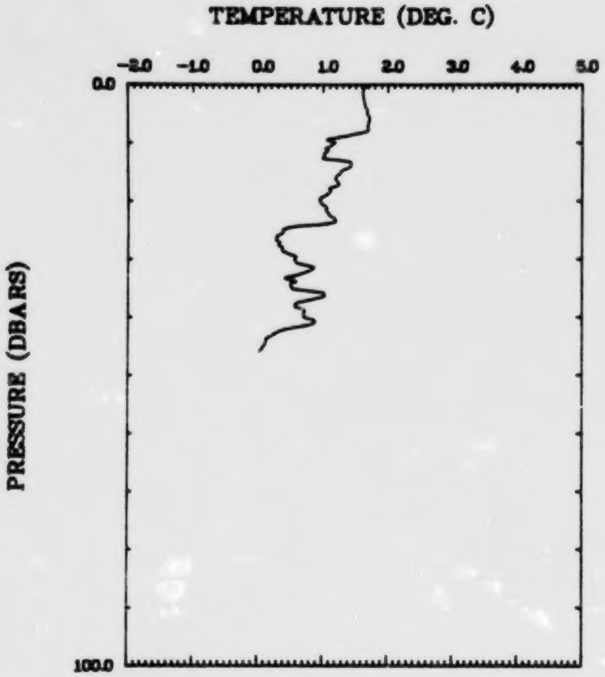


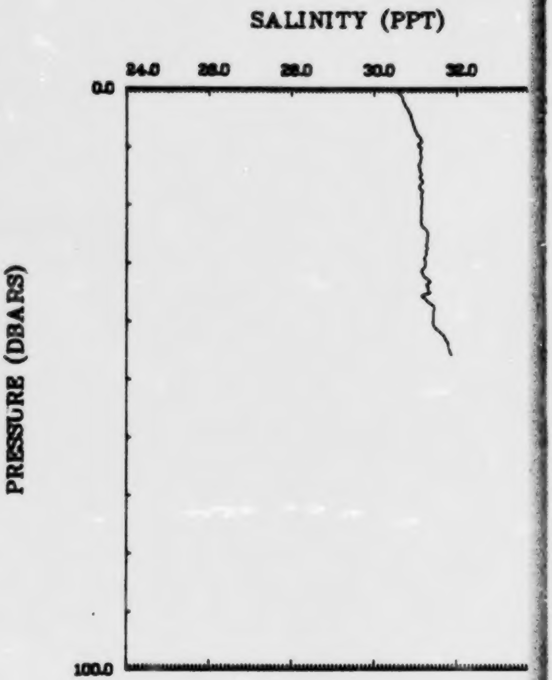


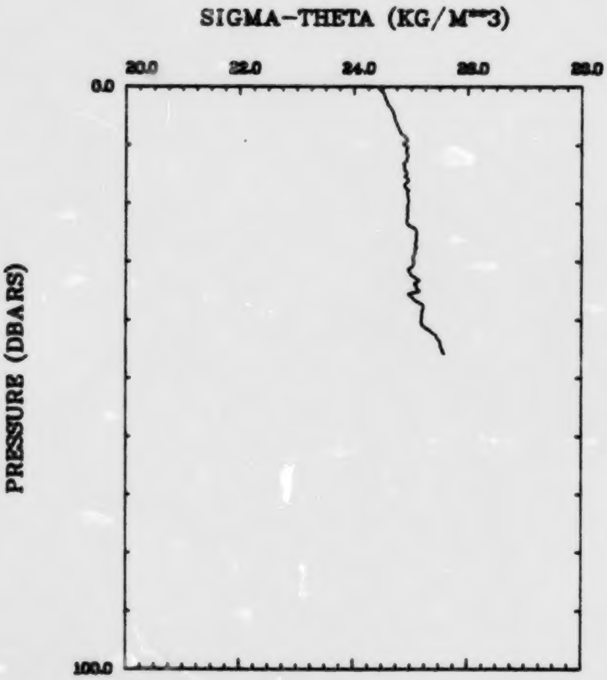


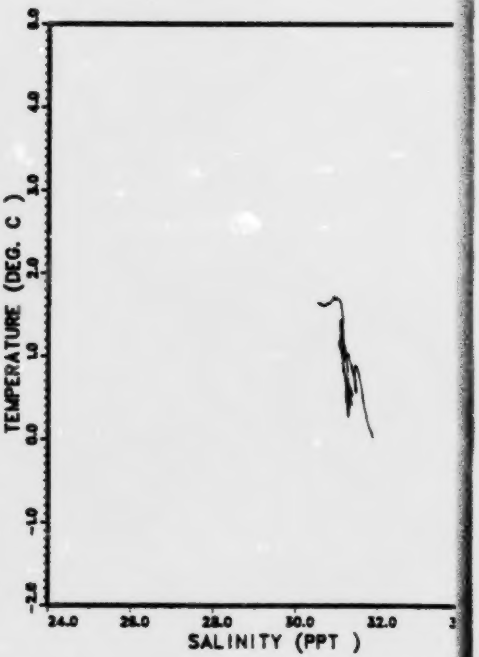


CAIS5 GREBE CTD 5 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

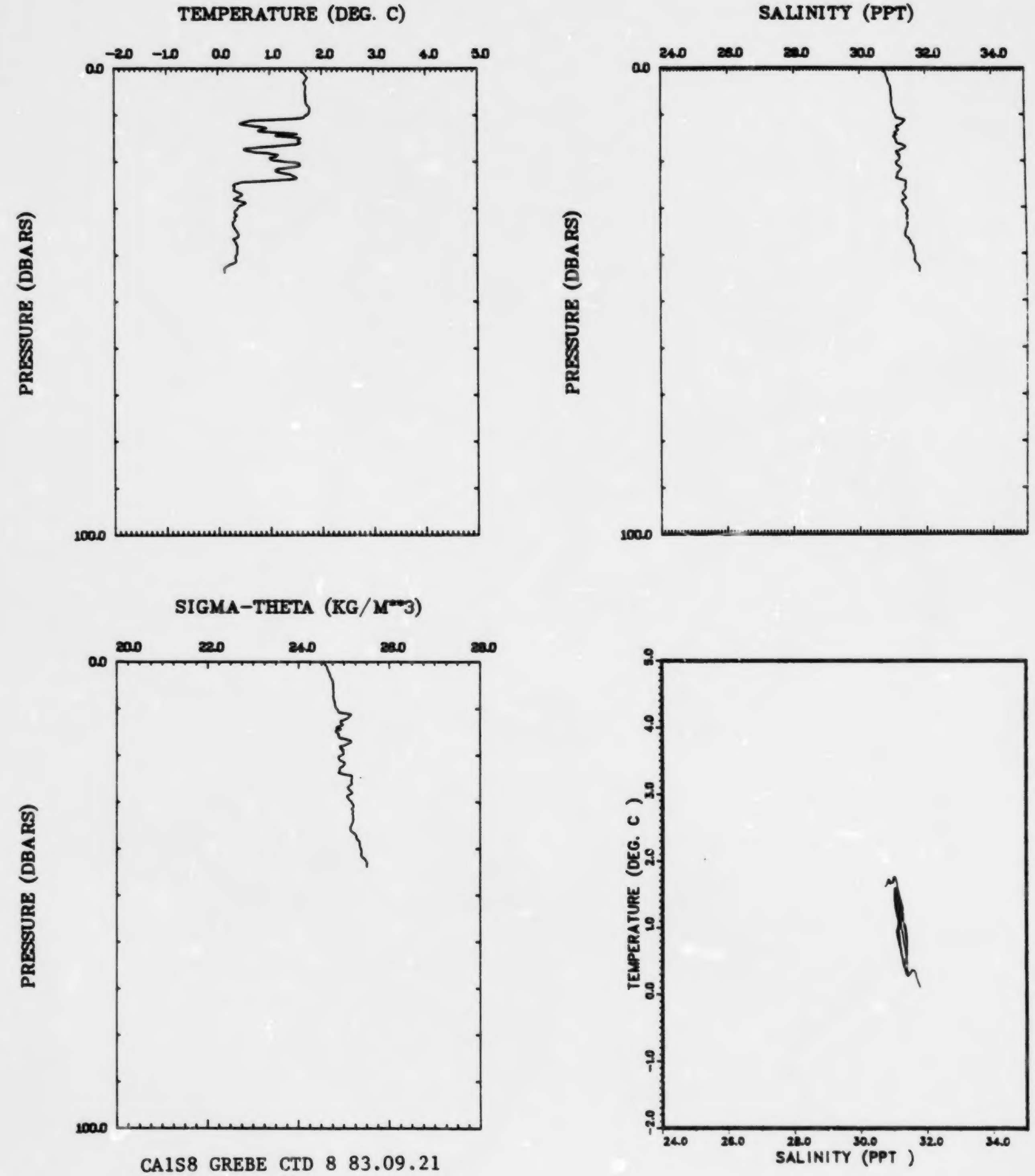




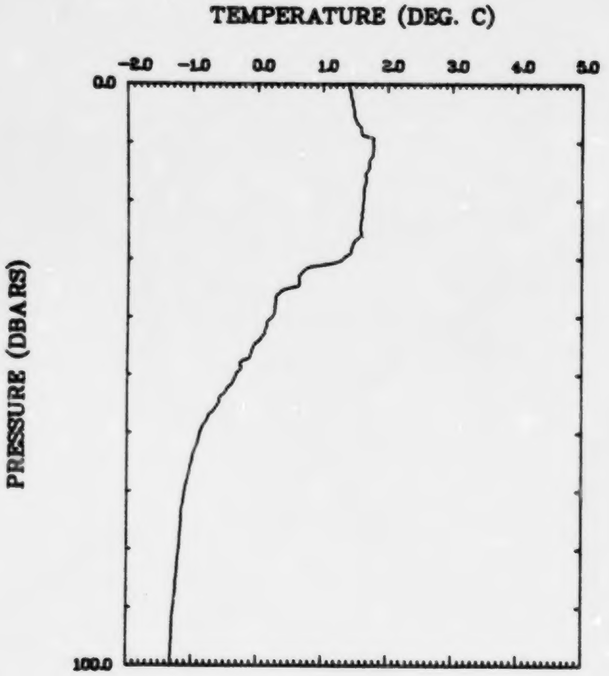


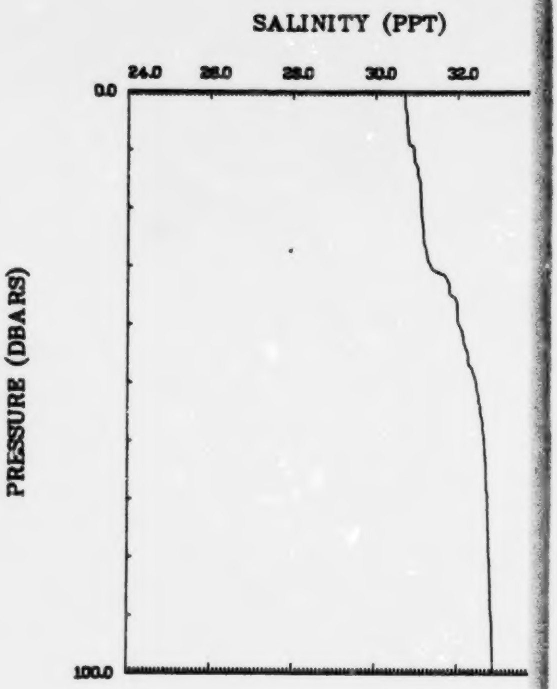


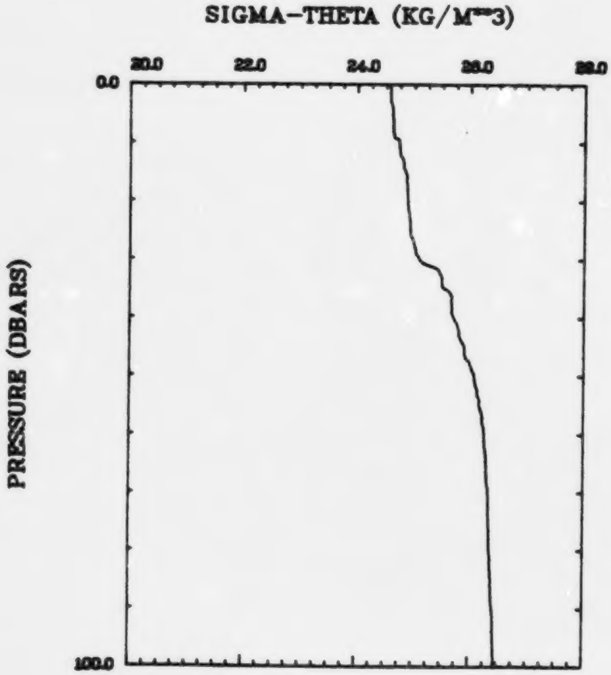
CA1S6 GREBE CTD 6 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

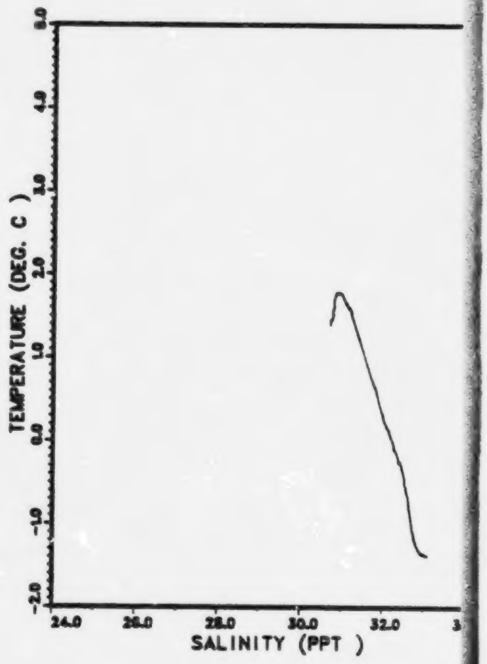


CA1S8 GREBE CTD 8 83.09.21
Lat. 71 11.2'N
Lon. 75 4.1'W

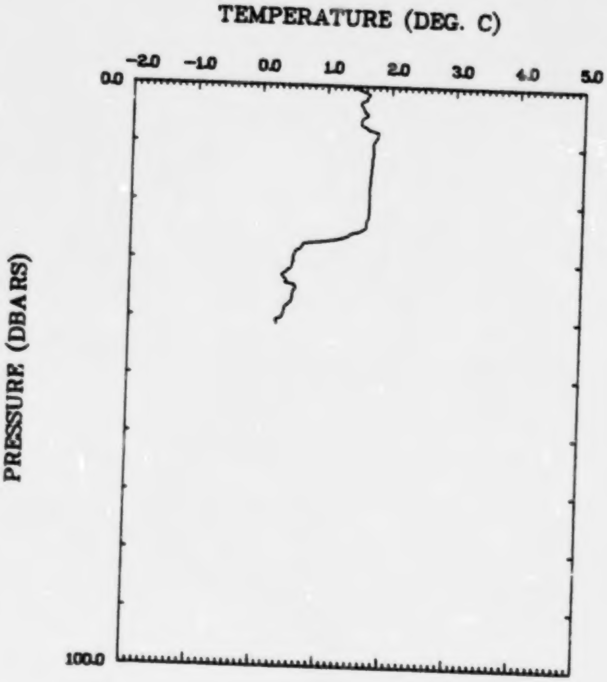

TEMPERATURE (DEG. C)

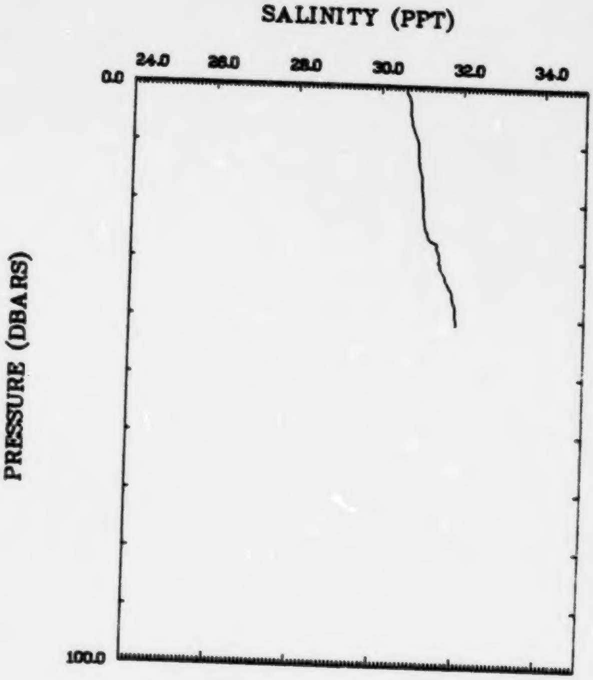

SALINITY (PPT)

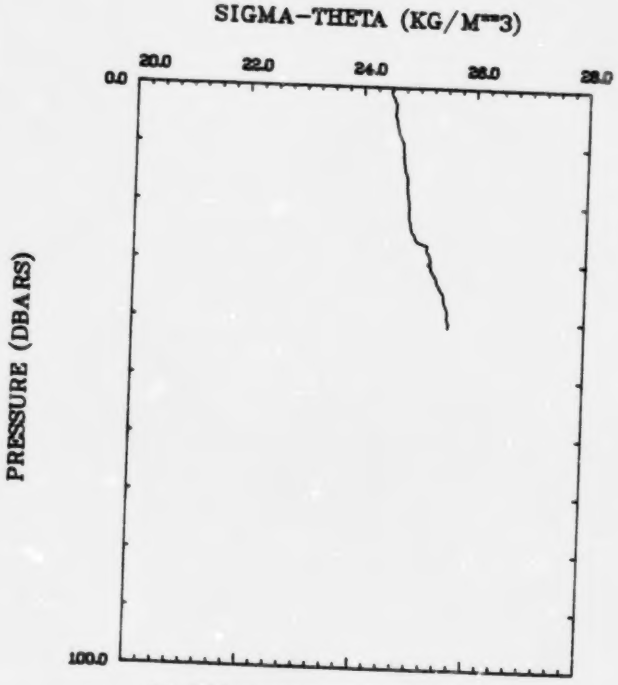

SIGMA-THETA (KG/M**3)

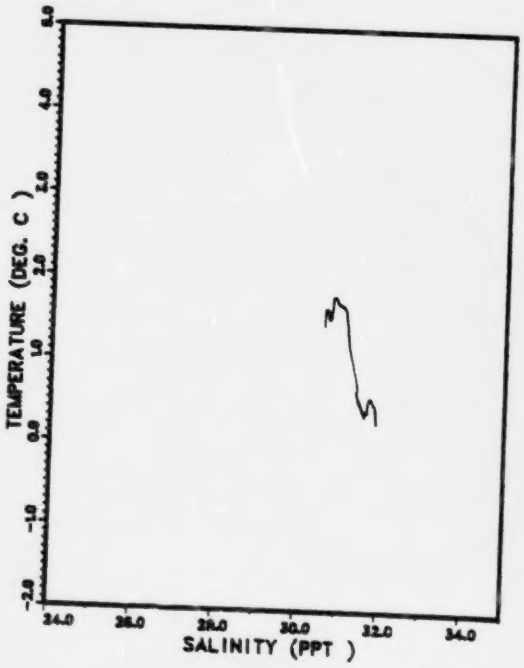


CA S9 GREBE CTD 9 83.09.22
Lat. 71 11.5'N
Lon. 75 2.7'W

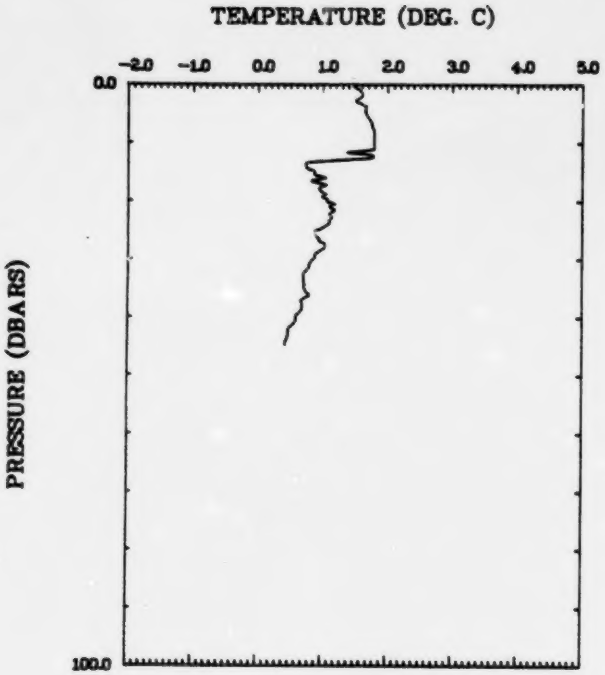


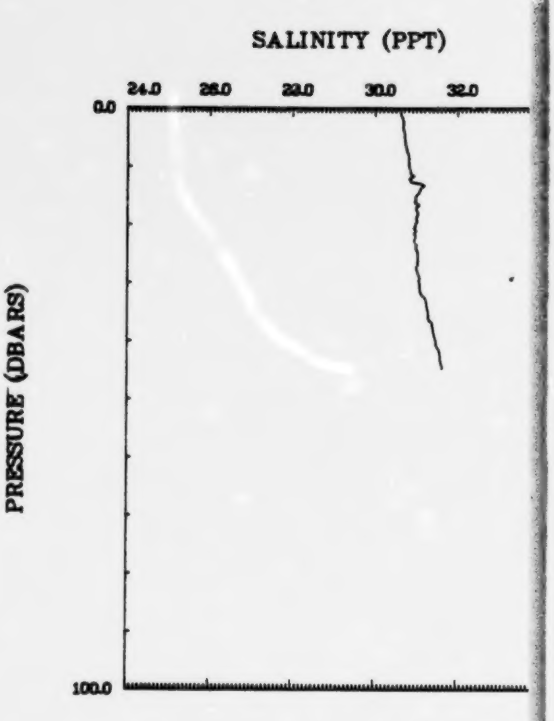


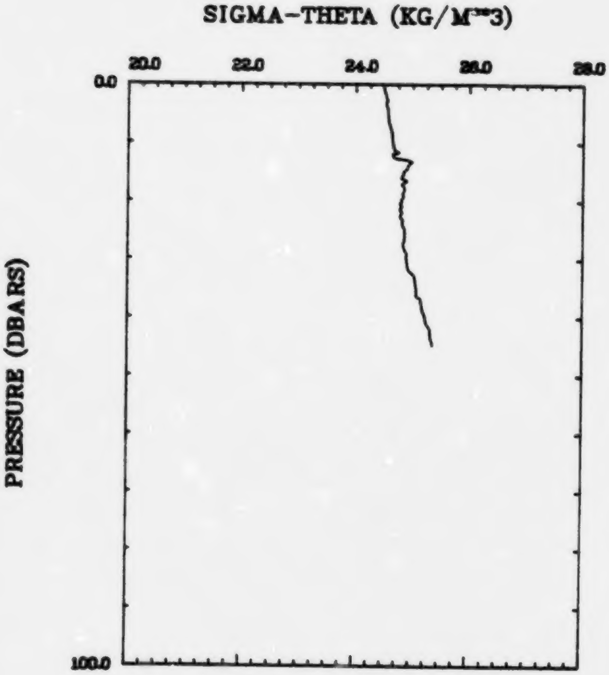


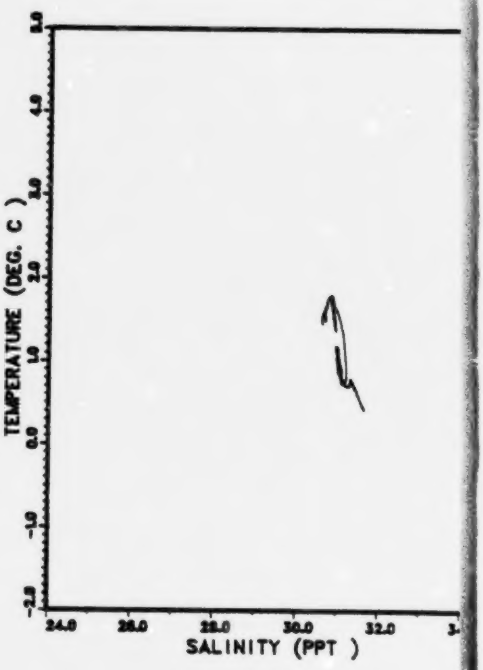


CA S10 GREBE CTD 10 83.09.22
Lat. 71 11.2'N
Lon. 75 4.1'W



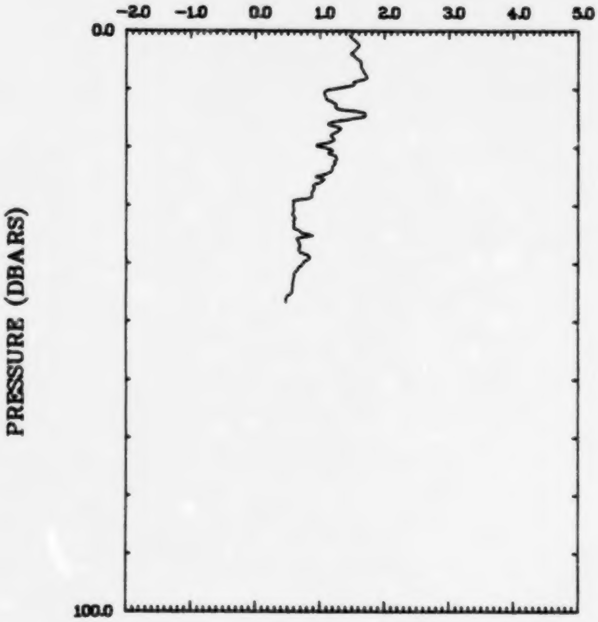




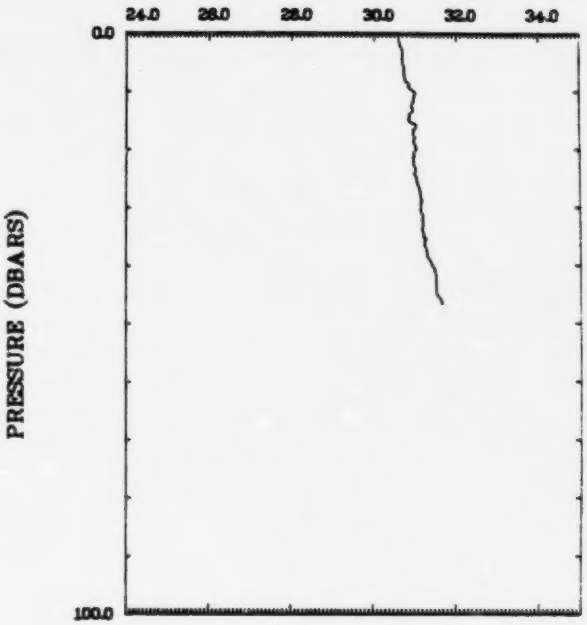


CA S11 GREBE CTD 11 83.09.22
Lat. 71 11.2'N
Lon. 75 4.1'W

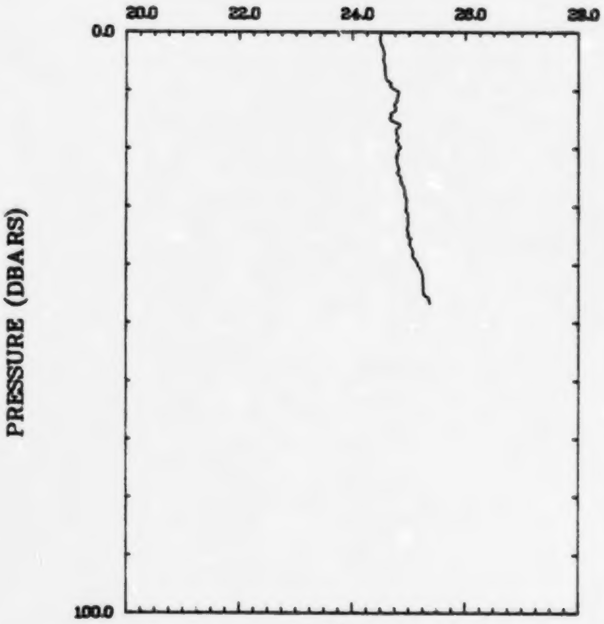
TEMPERATURE (DEG. C)

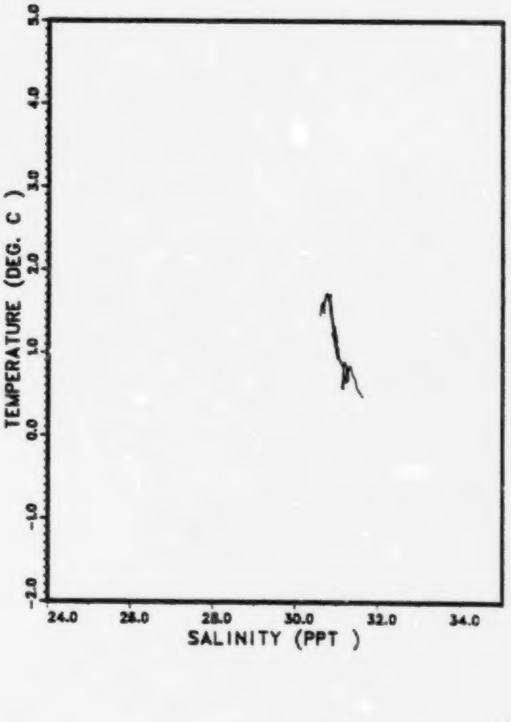


SALINITY (PPT)

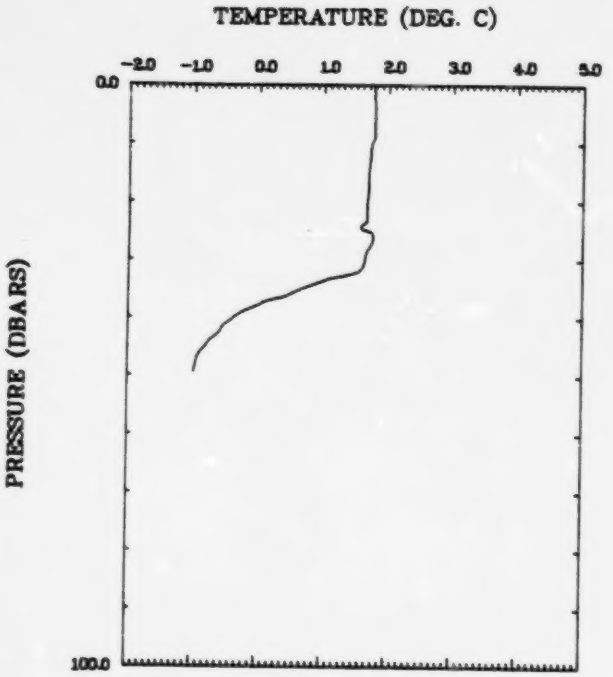


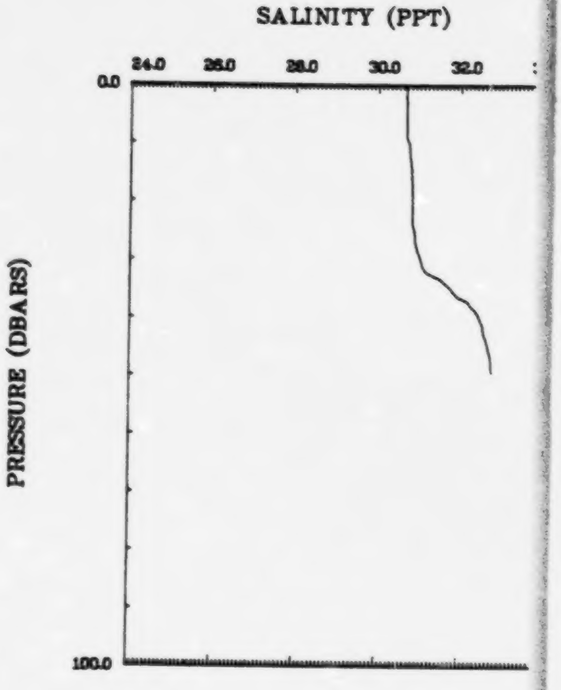
SIGMA-THETA (KG/M**3)

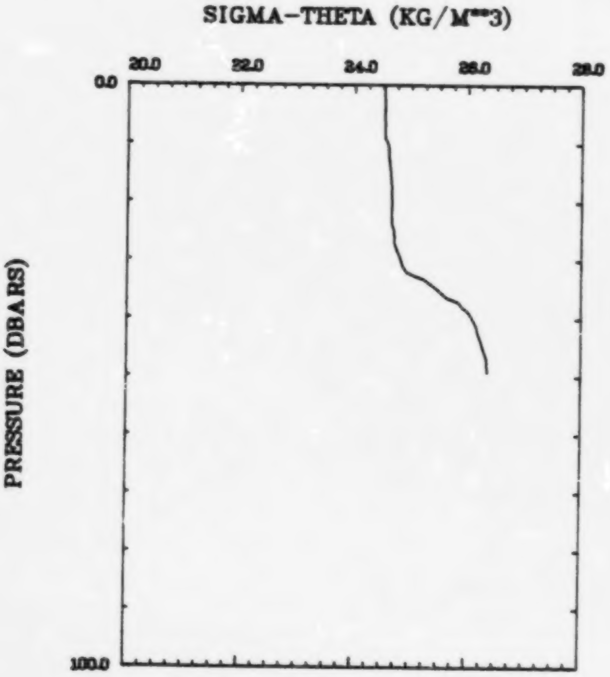


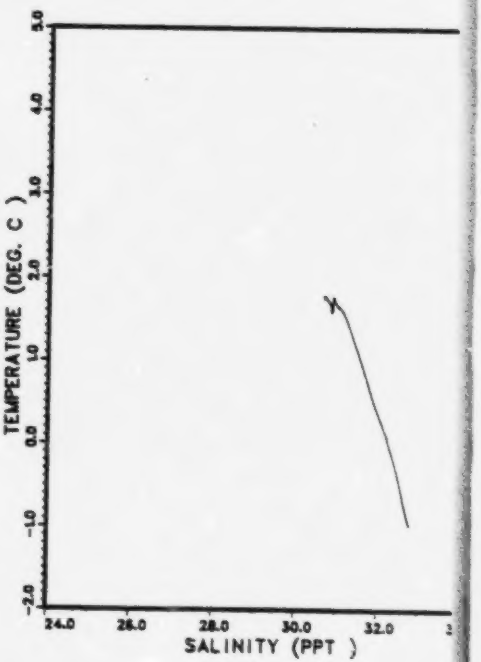


CA S12 GREBE CTD 12 83.09.22
Lat. 71 11.2'N
Lon. 75 4.1'W

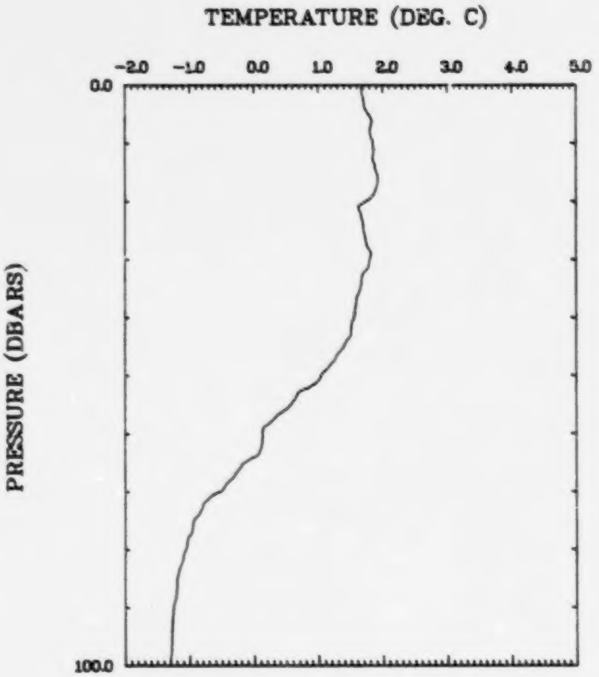


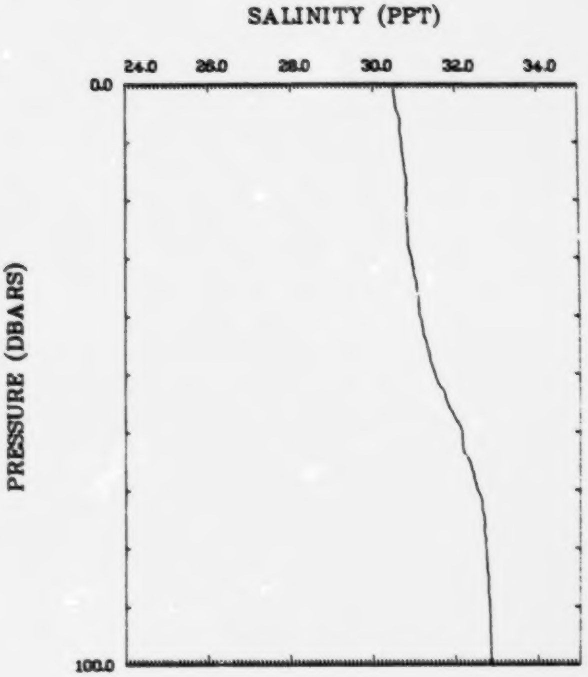


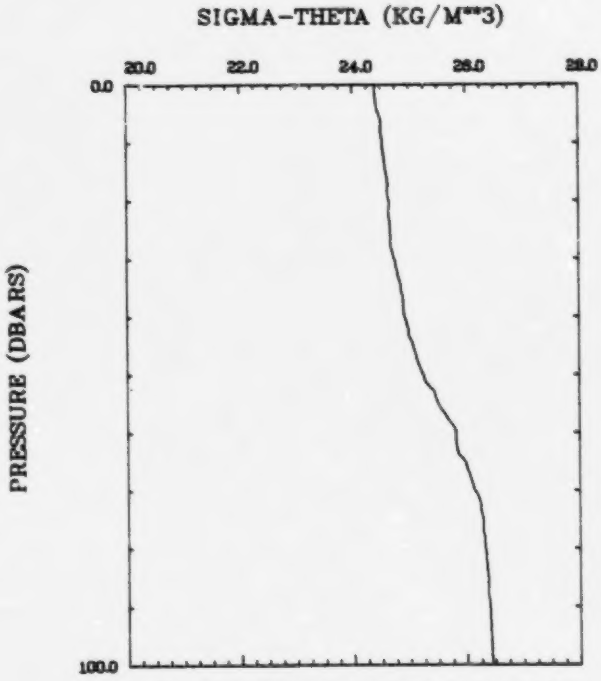


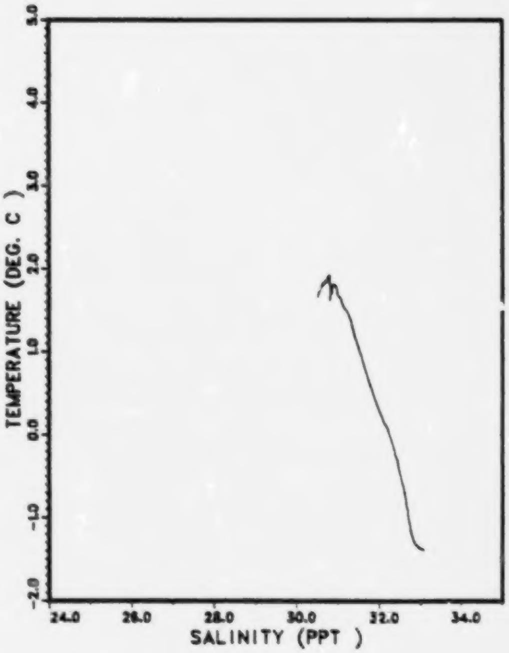


CA S15 GREBE CTD 15 83.09.22
Lat. 71 12.0'N
Lon. 75 5.0'W

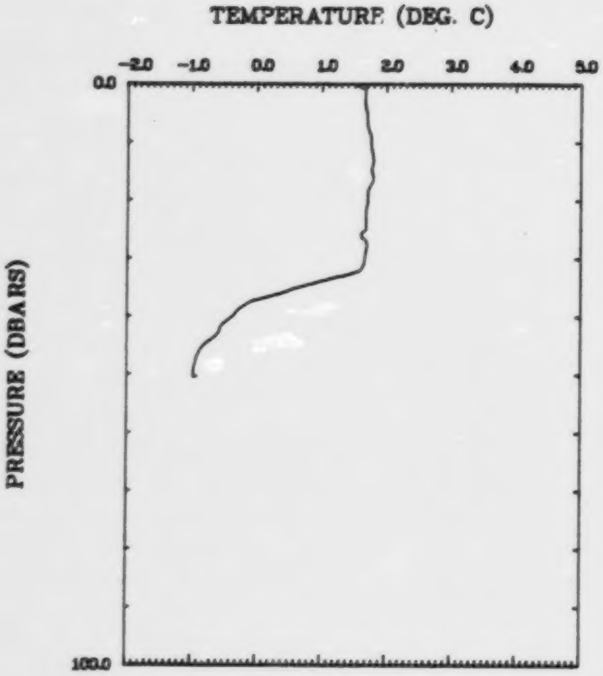


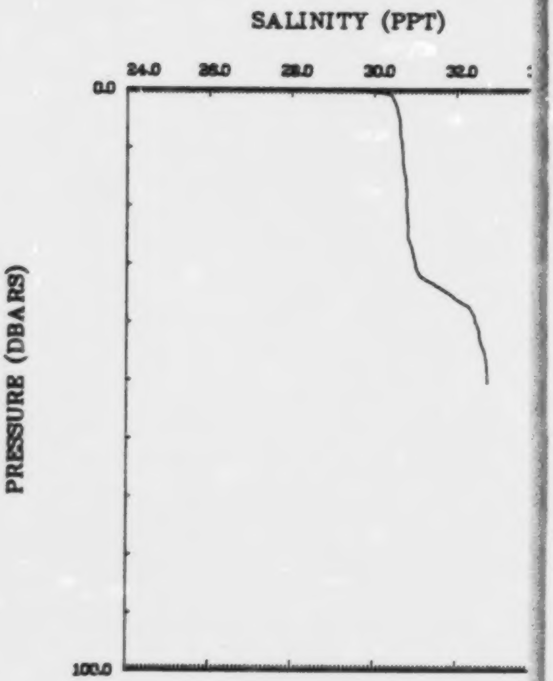


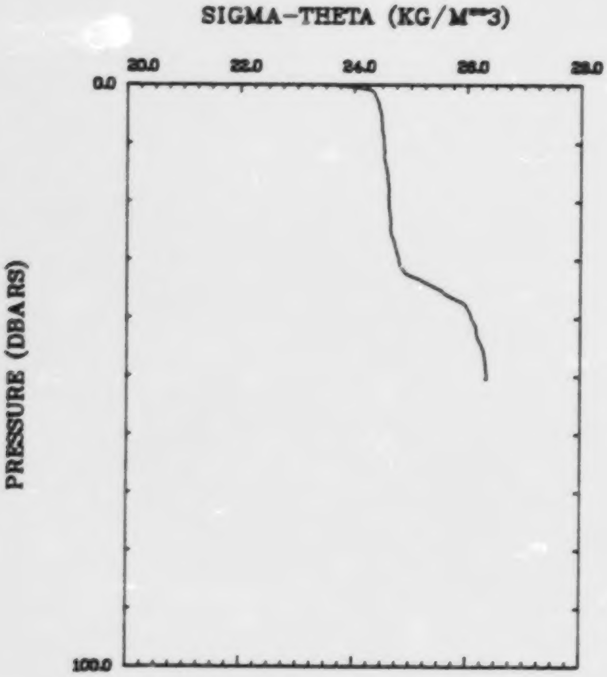


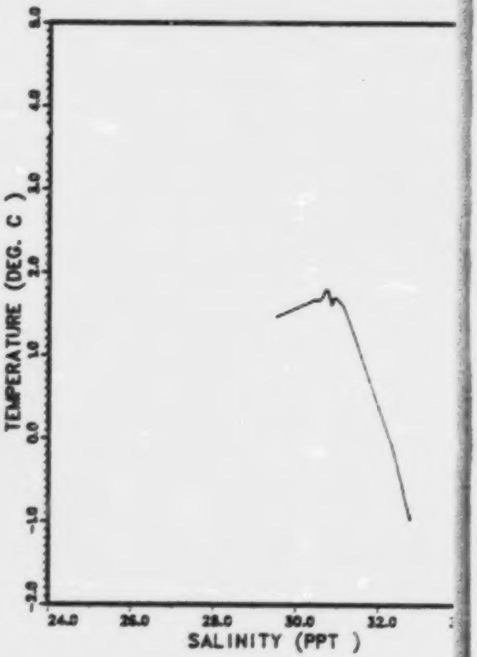


CA S16 GREBE CTD 16 83.09.22
Lat. 71 11.8'N
Lon. 75 3.3'W



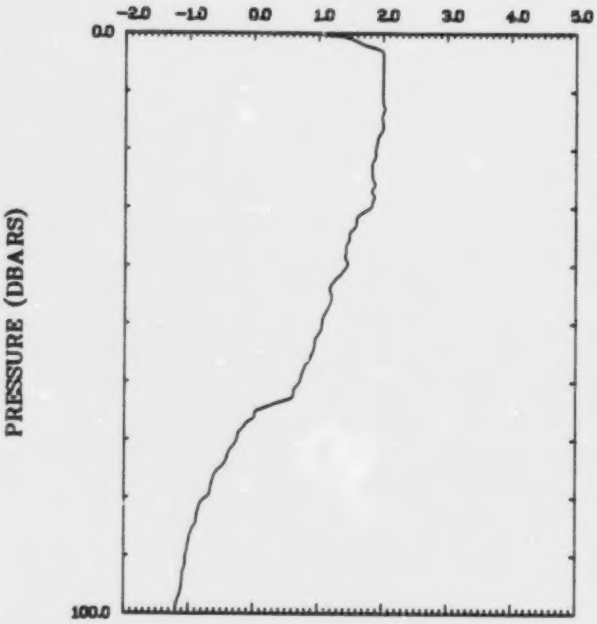




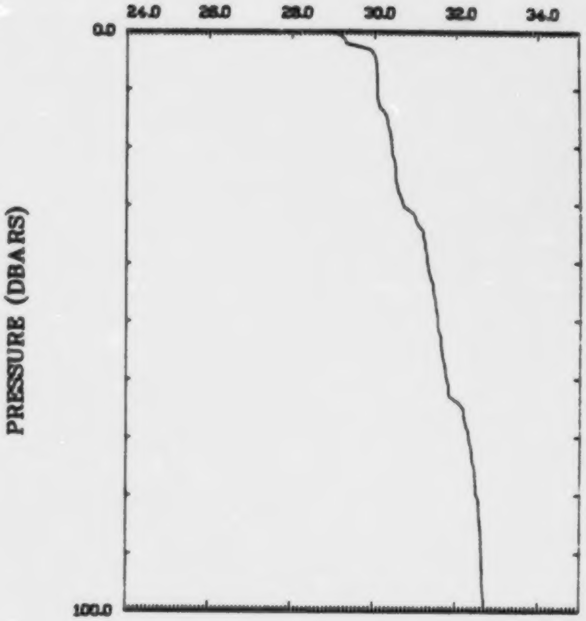


CA S17 GREBE CTD 17 83.09.22
Lat. 71 12.0'N
Lon. 75 5.2'W

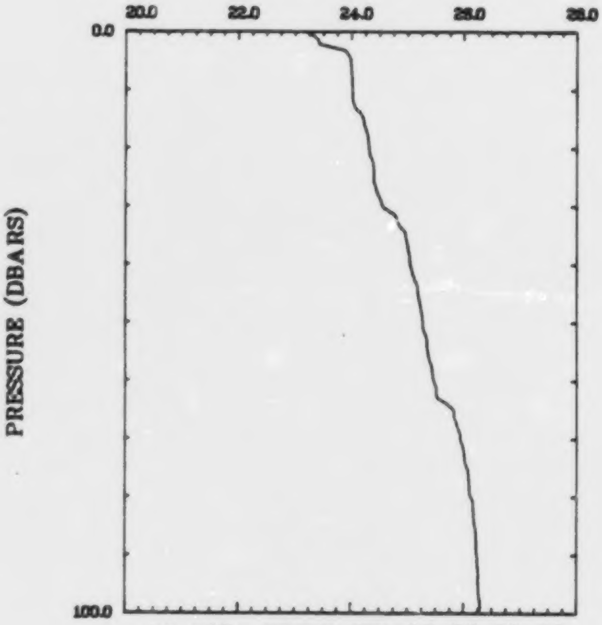
TEMPERATURE (DEG. C)

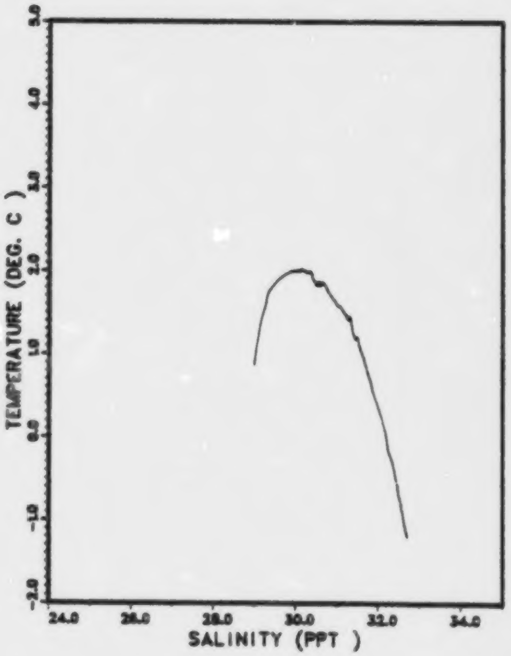


SALINITY (PPT)

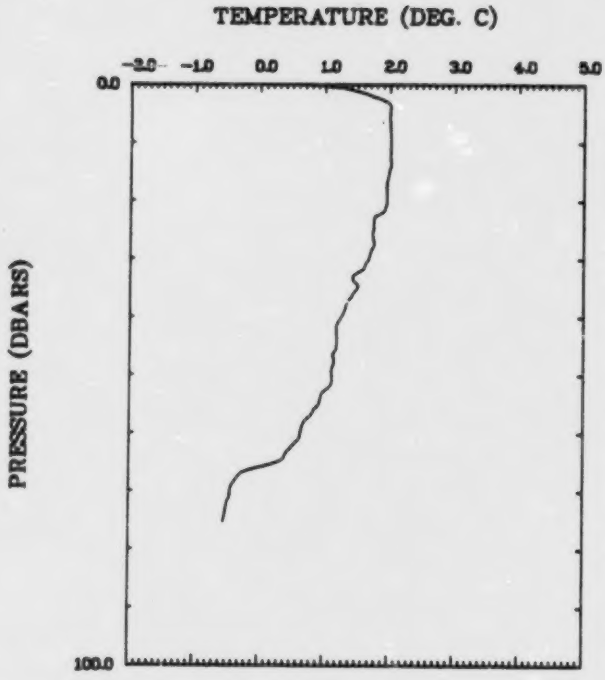


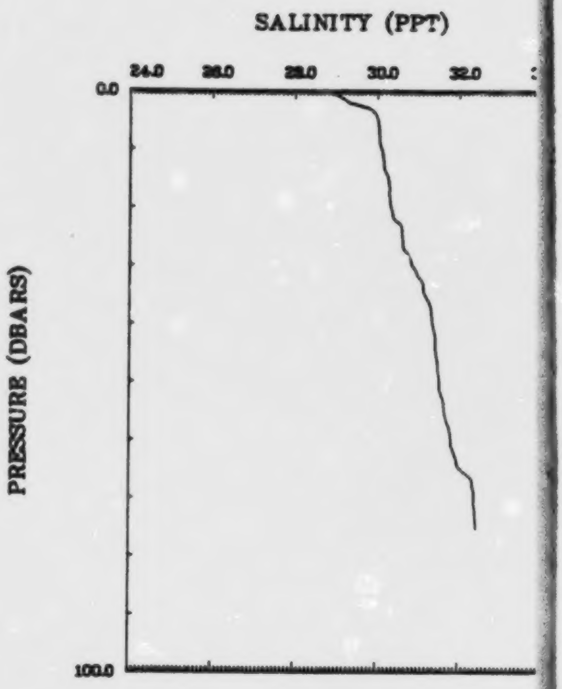
SIGMA-THETA (KG/M**3)

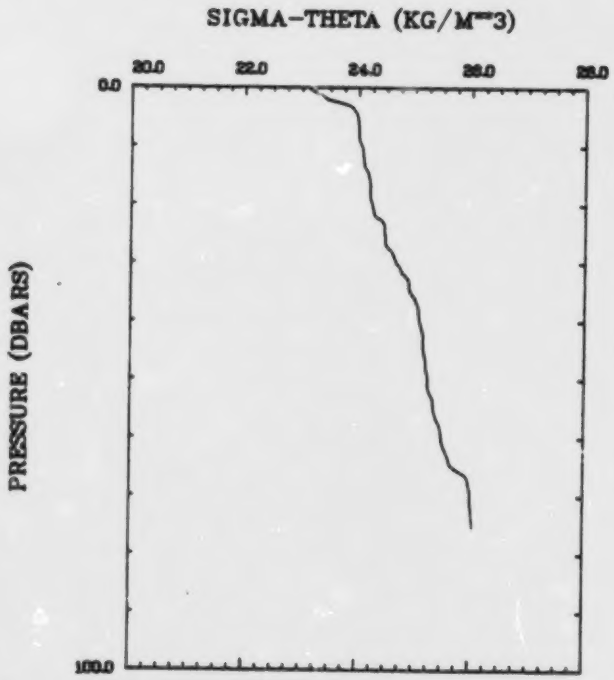


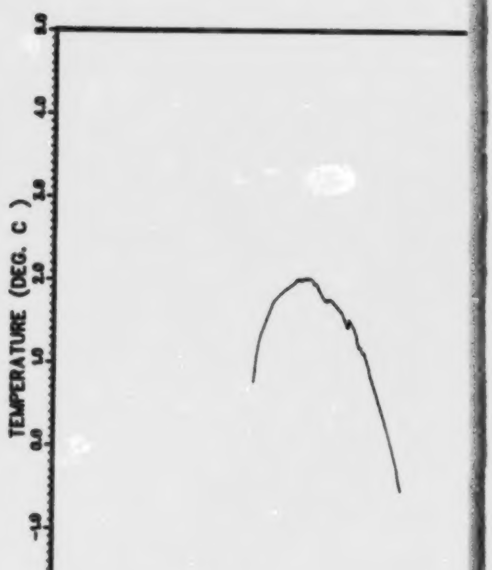


CA S18 GREBE CTD 18 83.09.24
Lat. 71 33.5'N
Lon. 74 36.6'W









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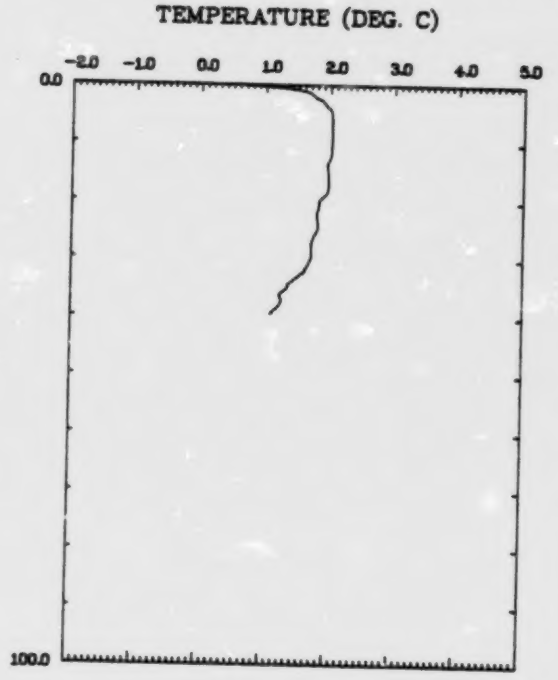

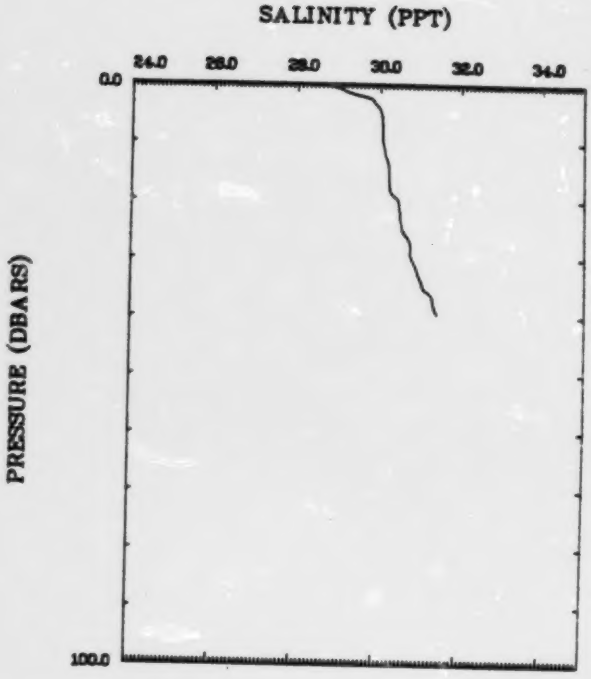

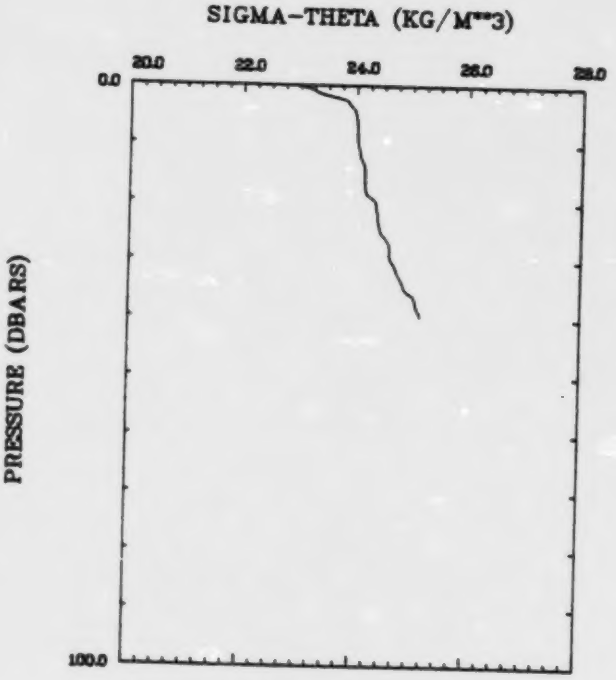

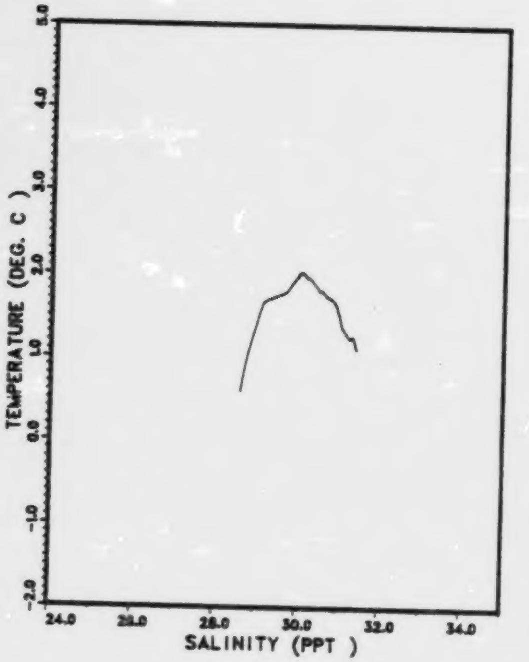

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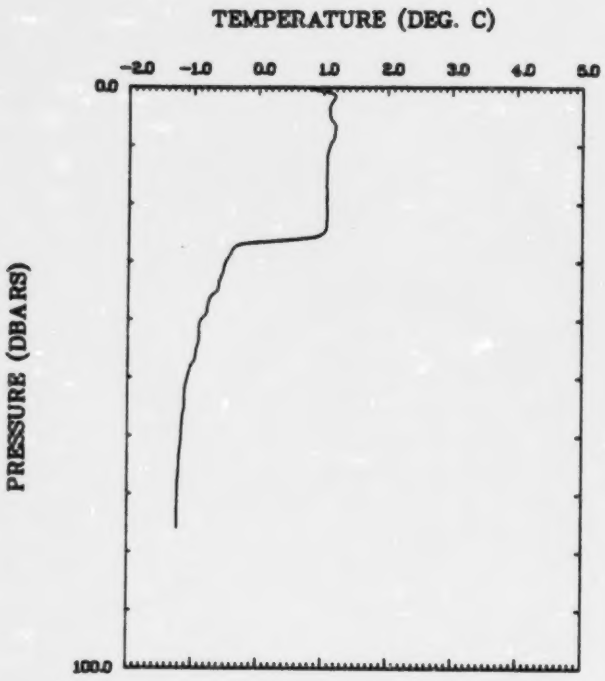

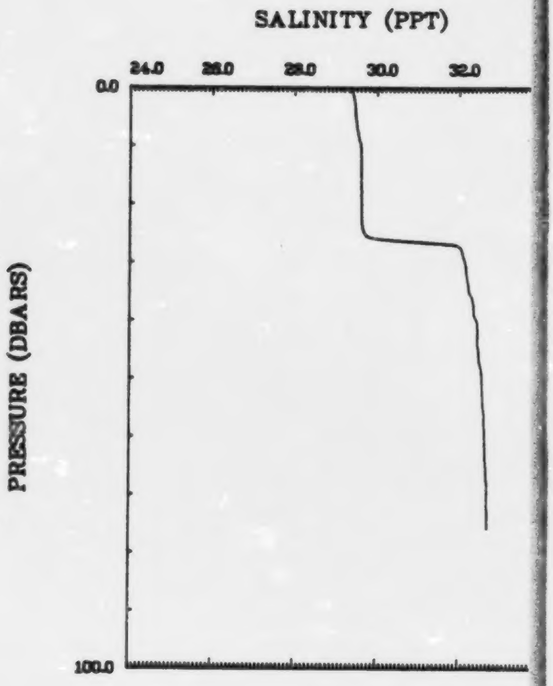

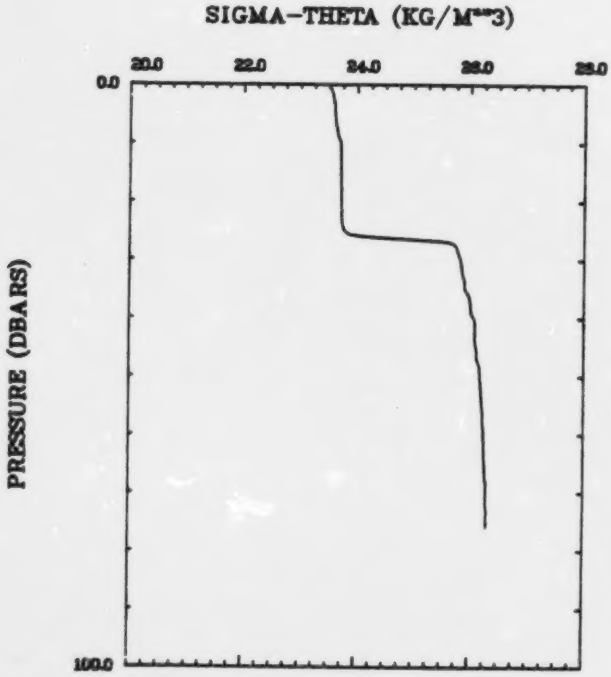

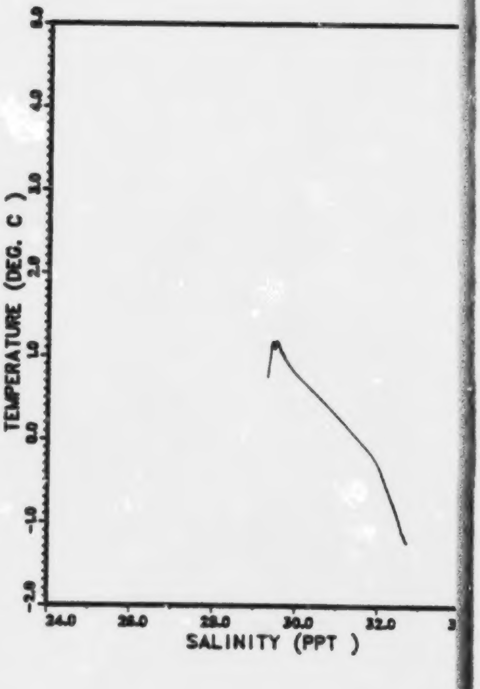

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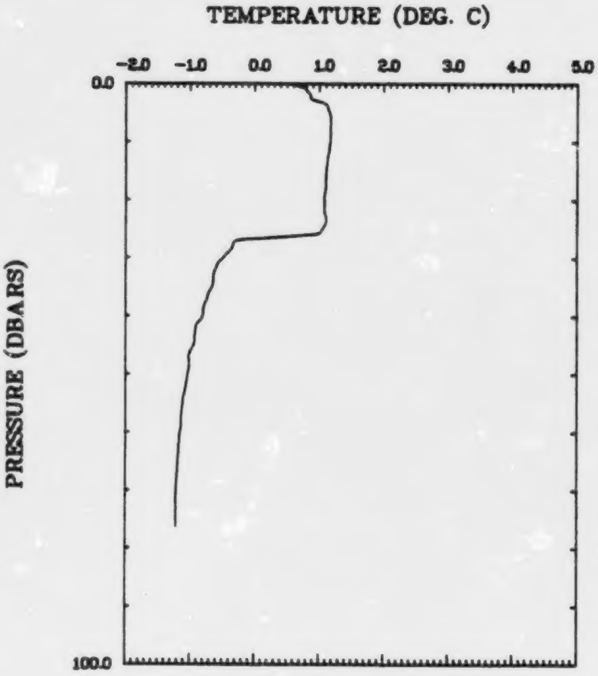

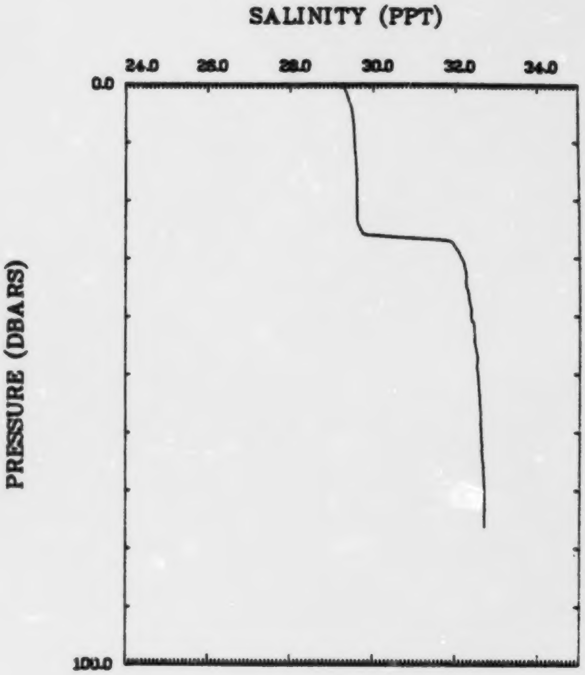

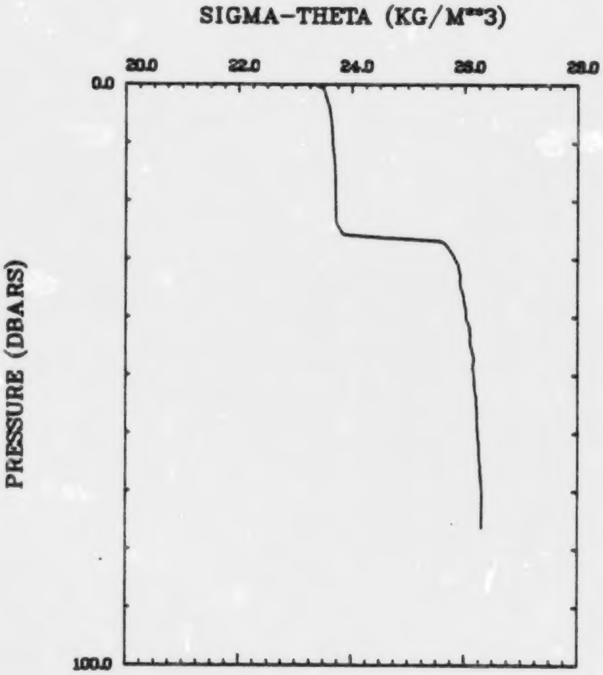

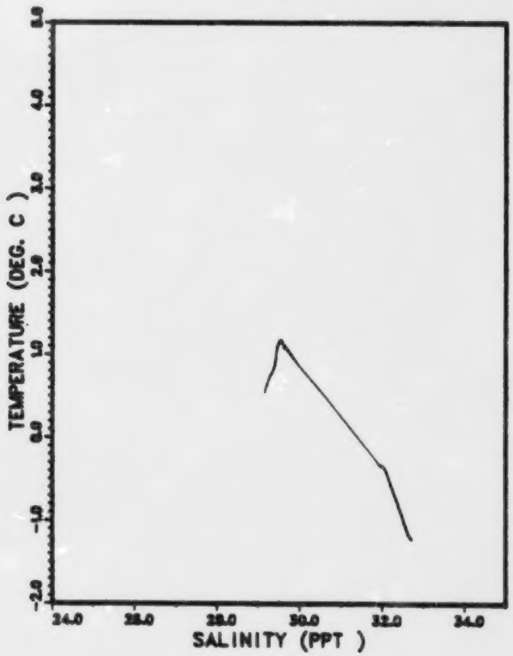

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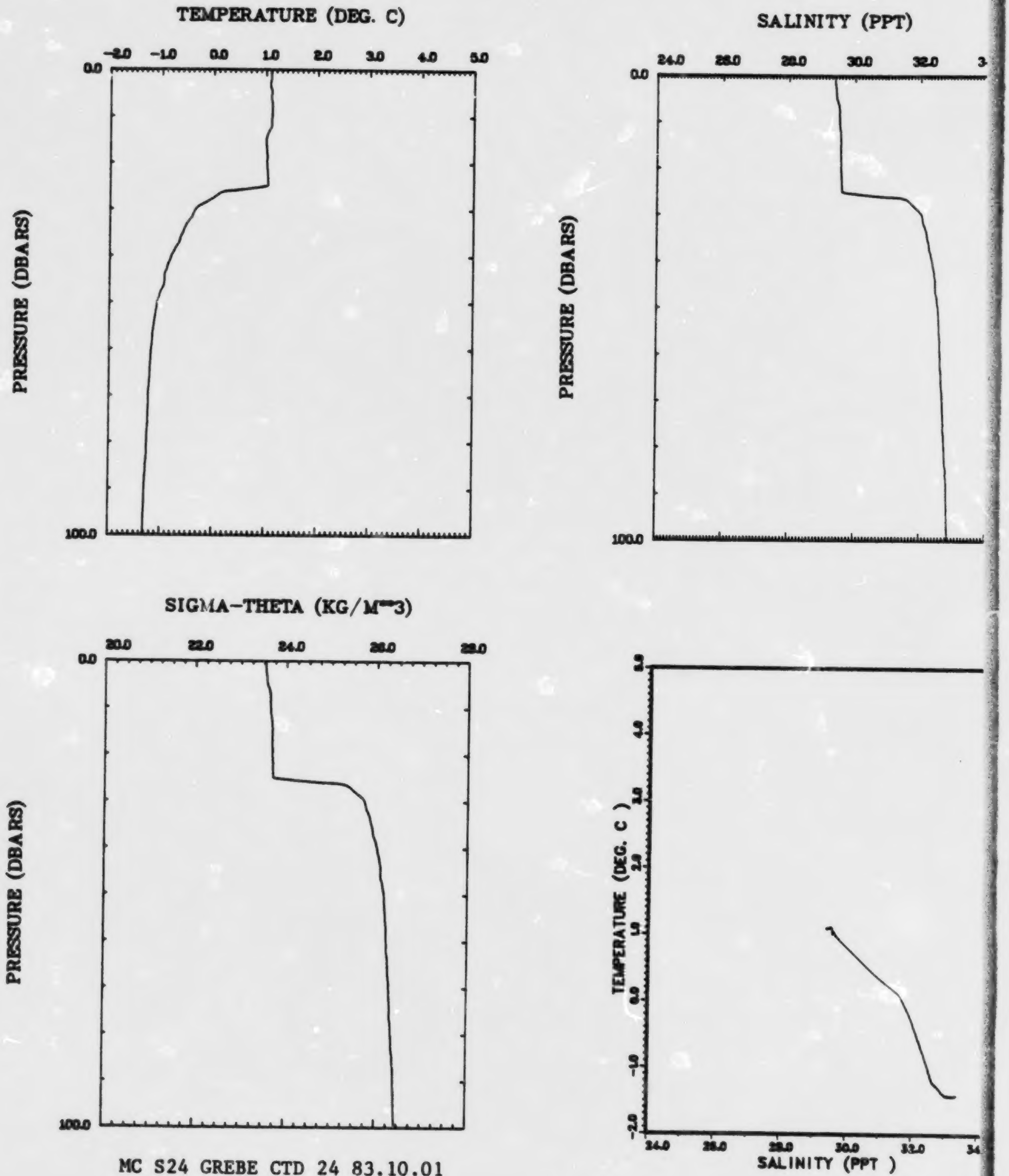

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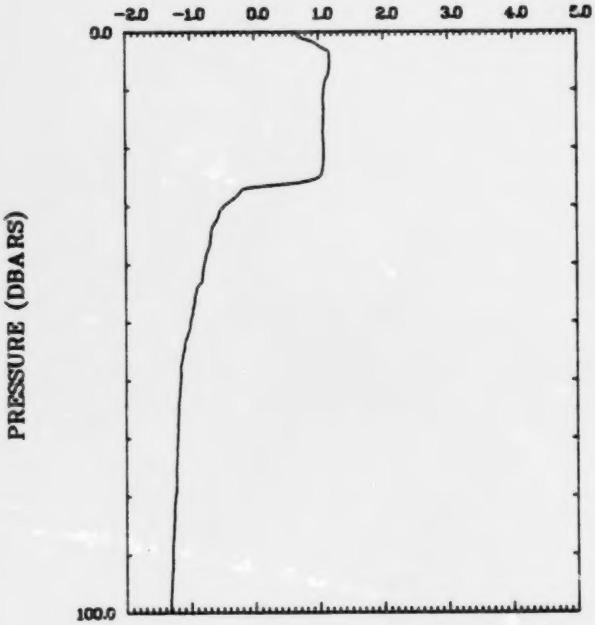
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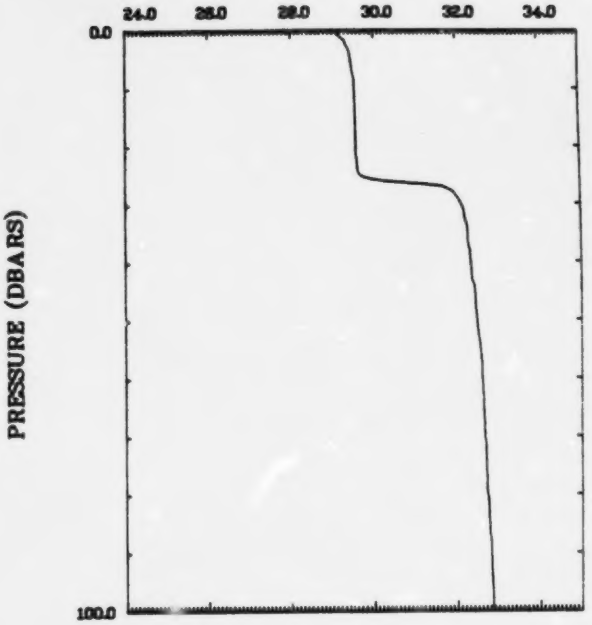
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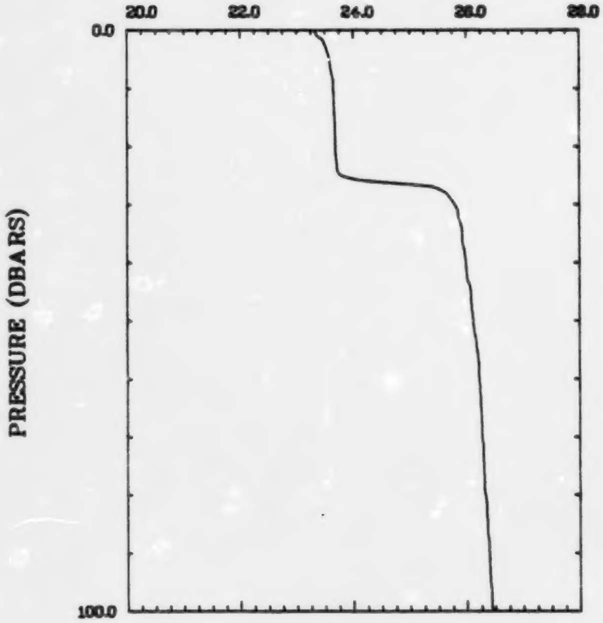
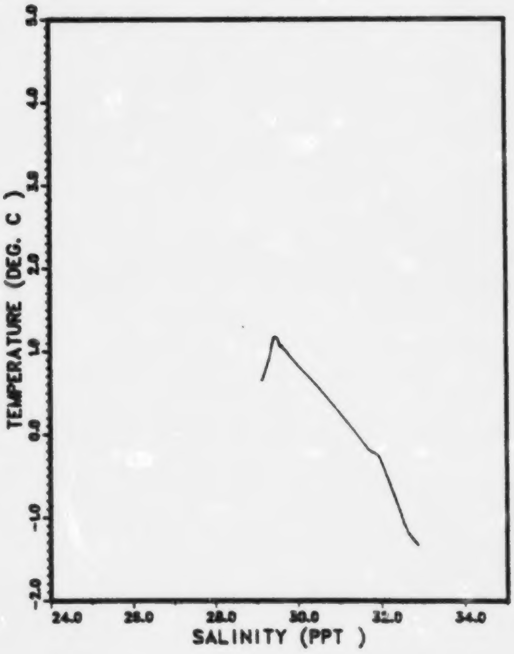

SIGMA-THETA (KG/M**3)



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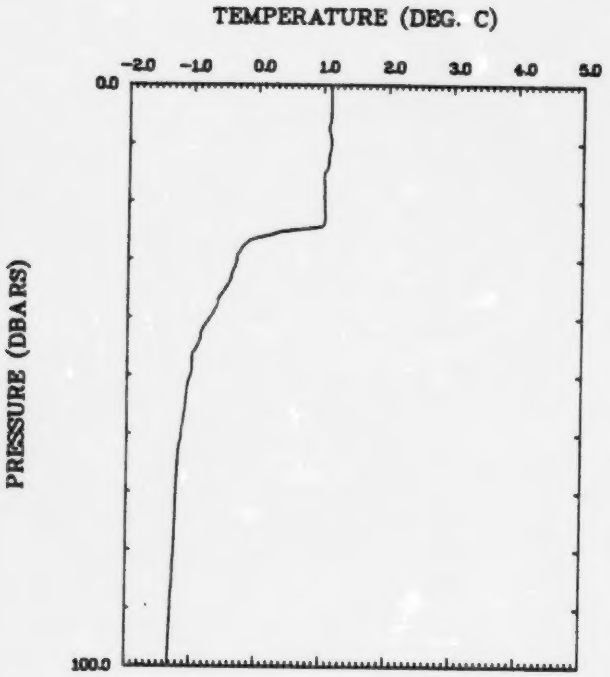
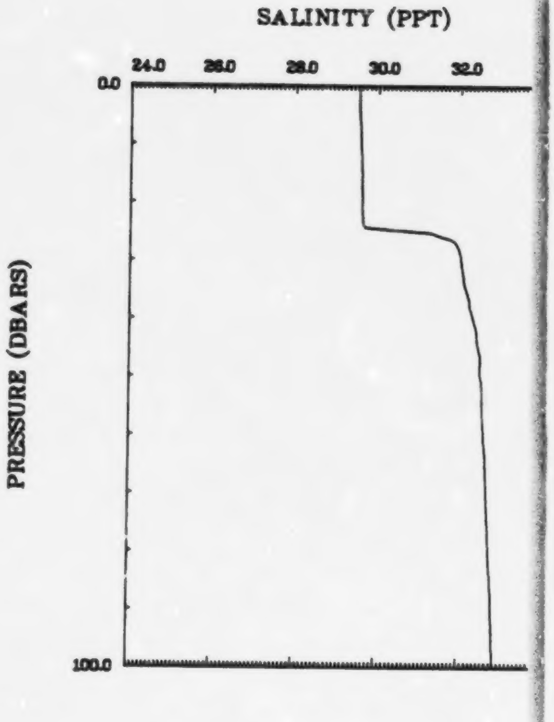
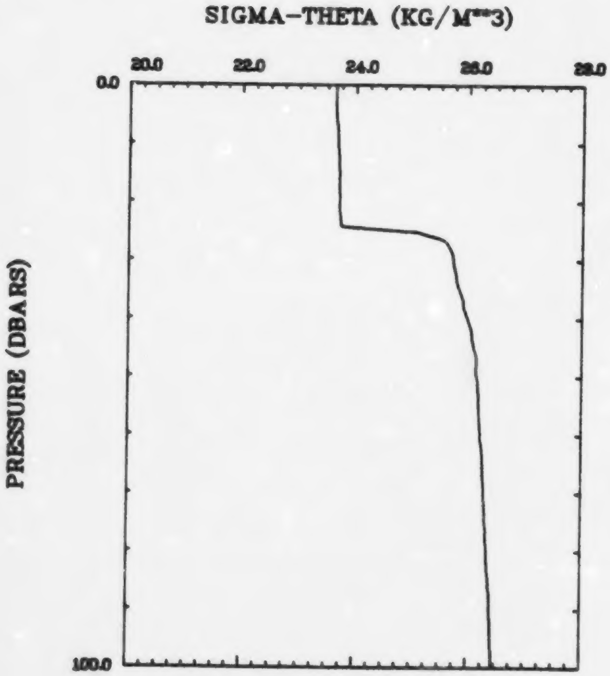
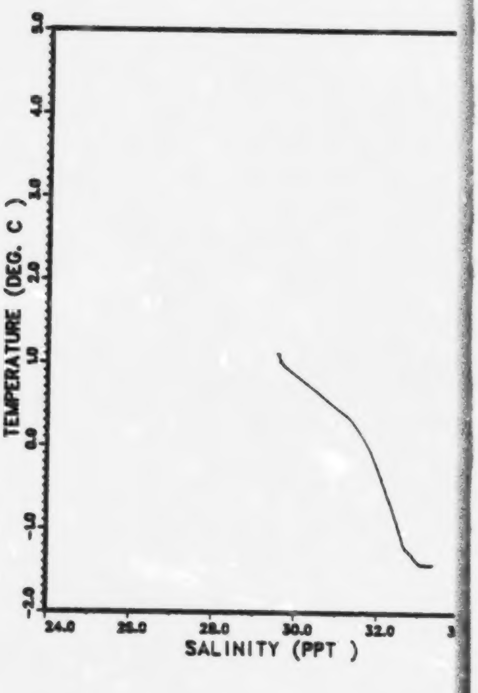
Lon. 69 59.2'W









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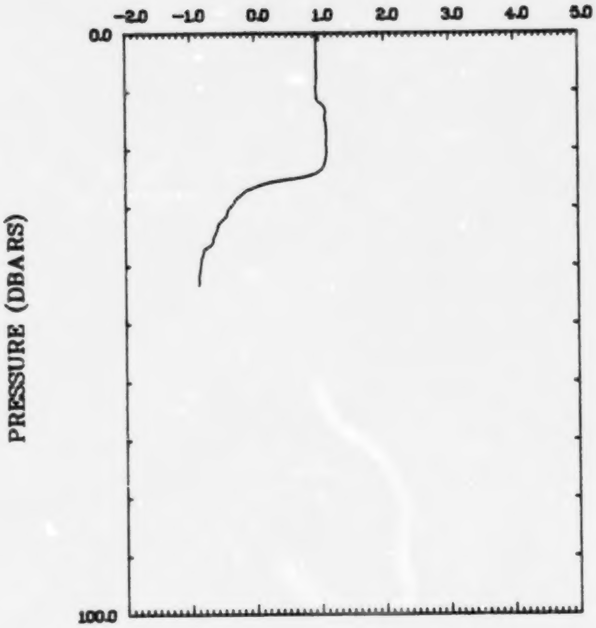
TEMPERATURE (DEG. C)



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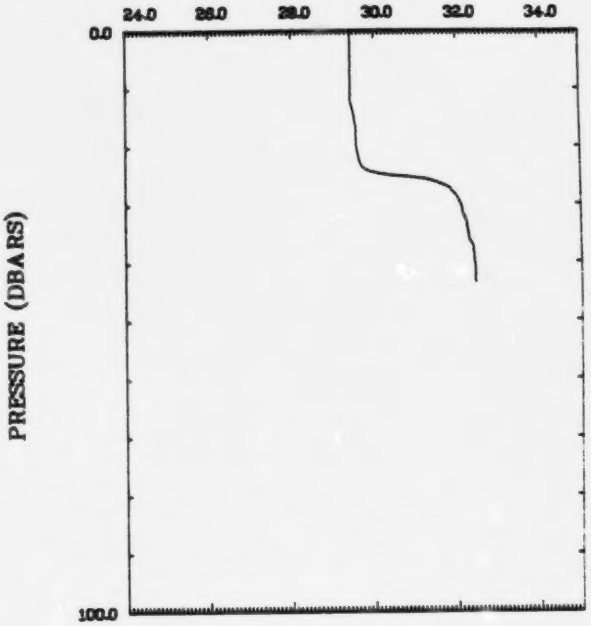
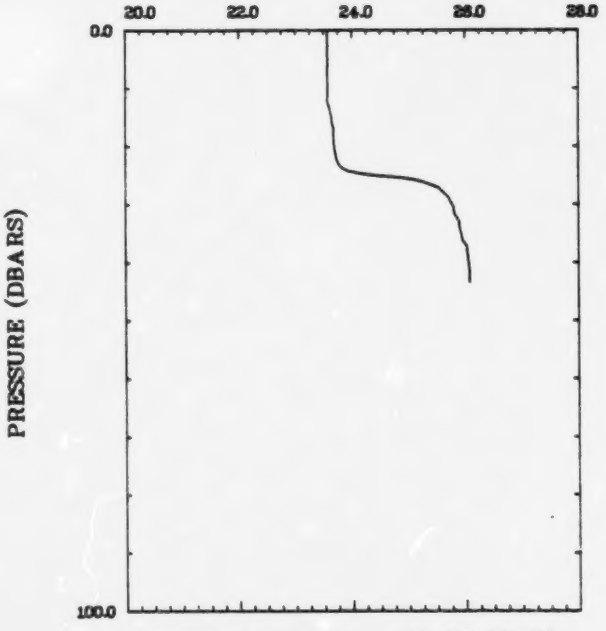
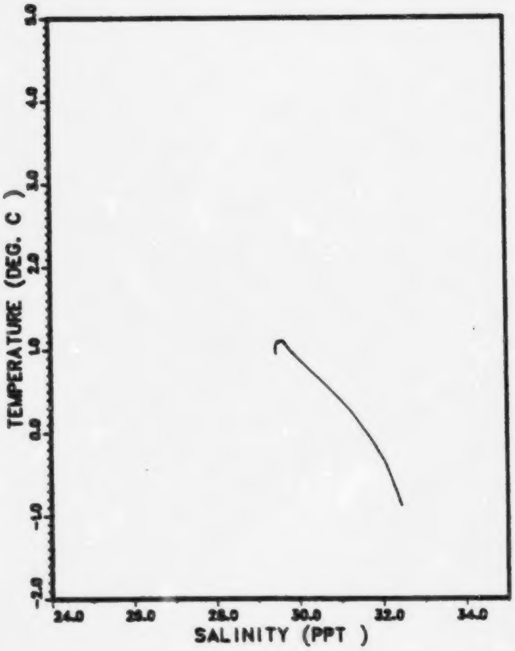


SIGMA-THETA (KG/M**3)





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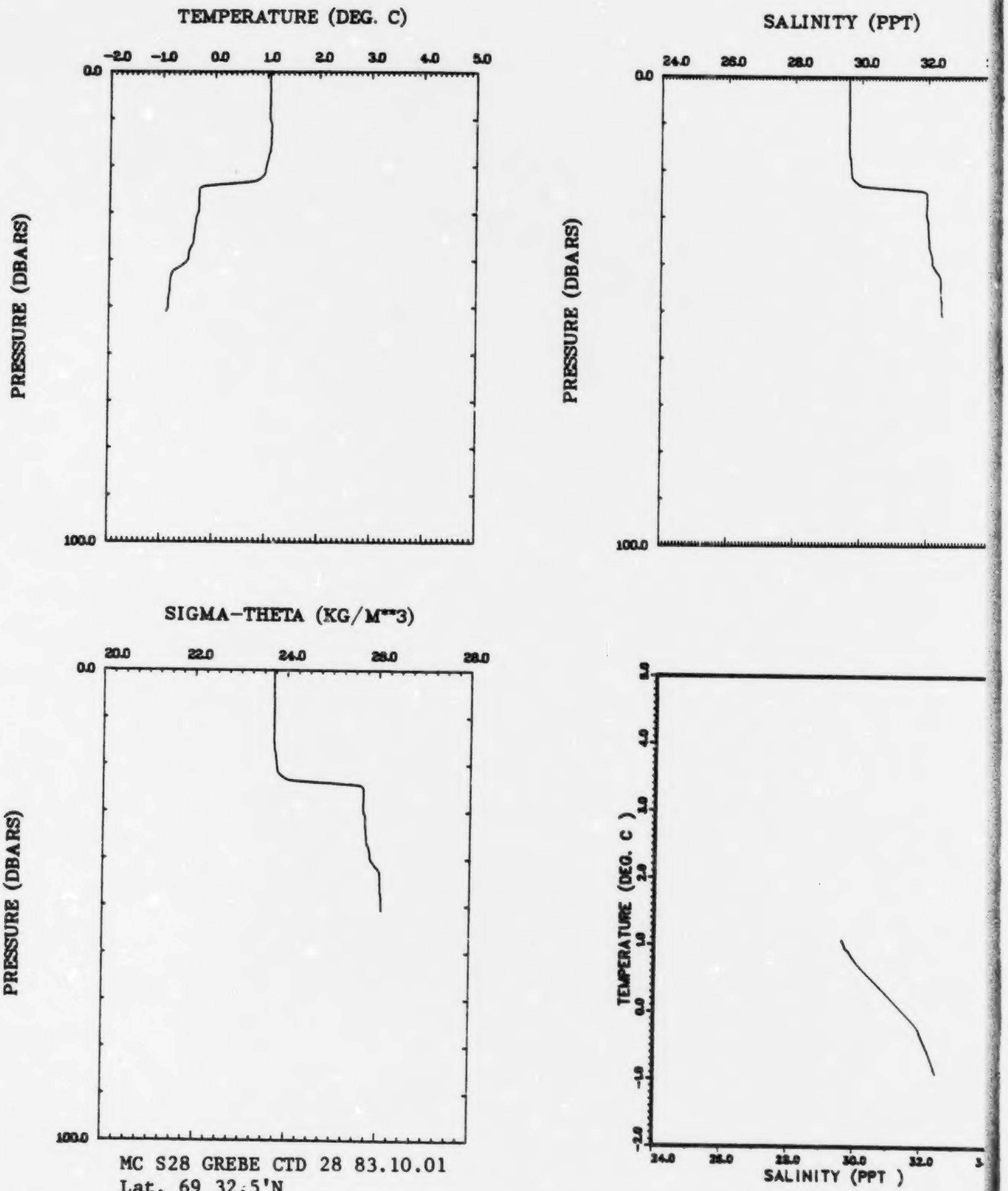

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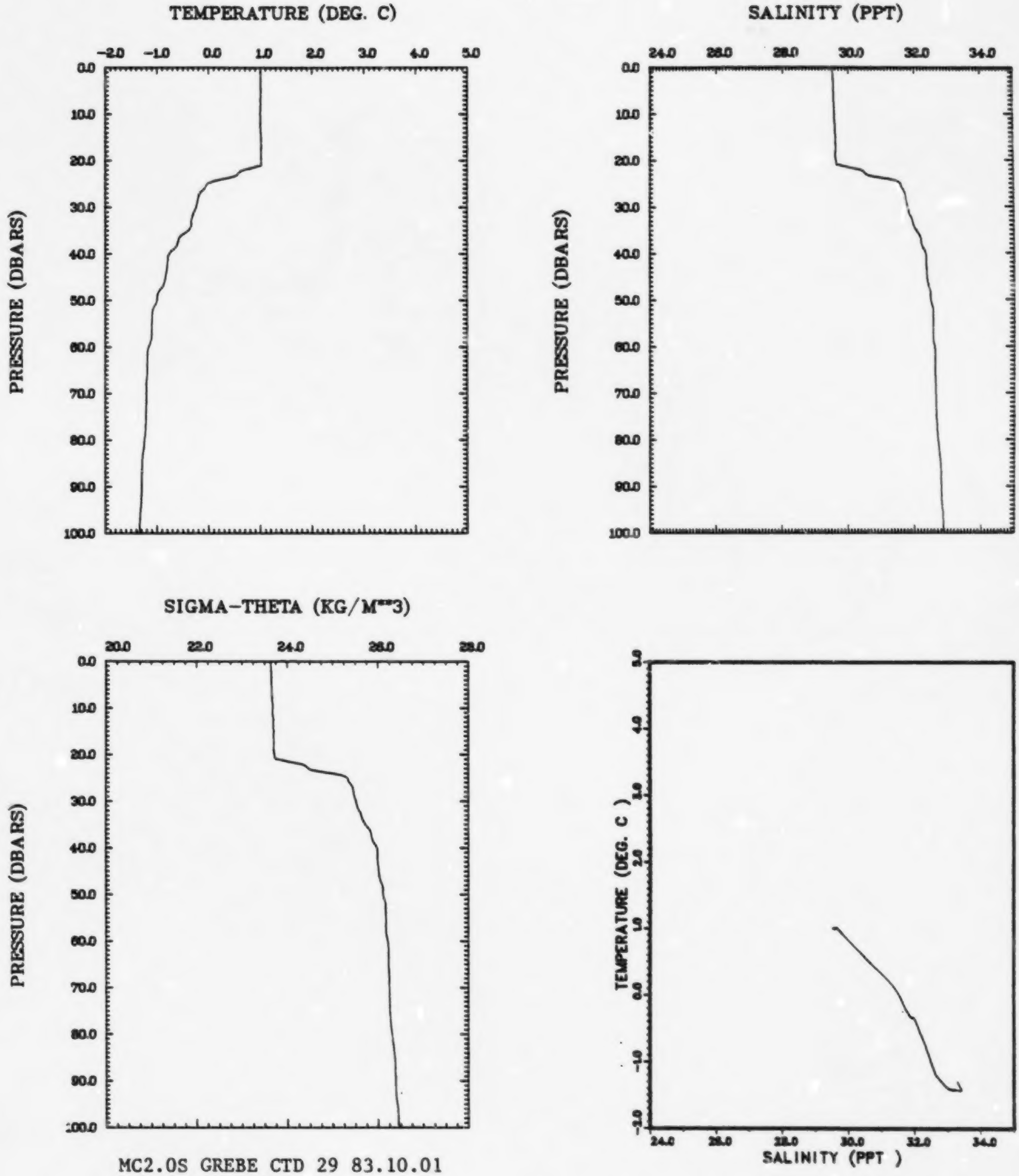

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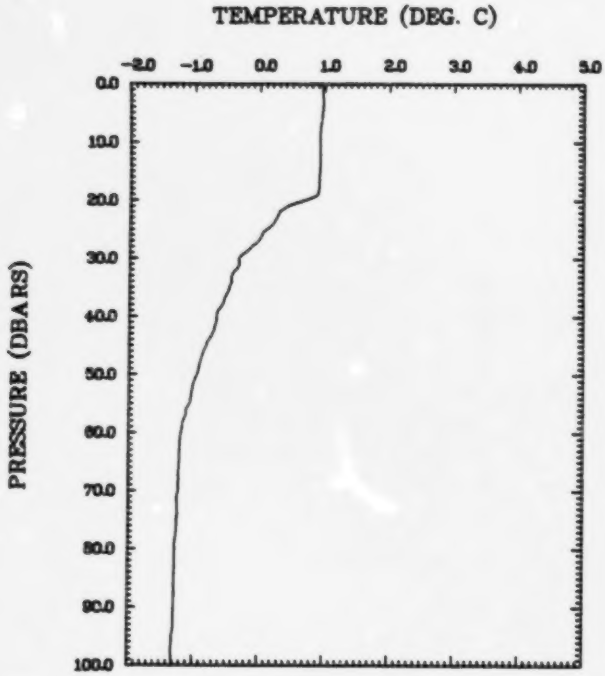
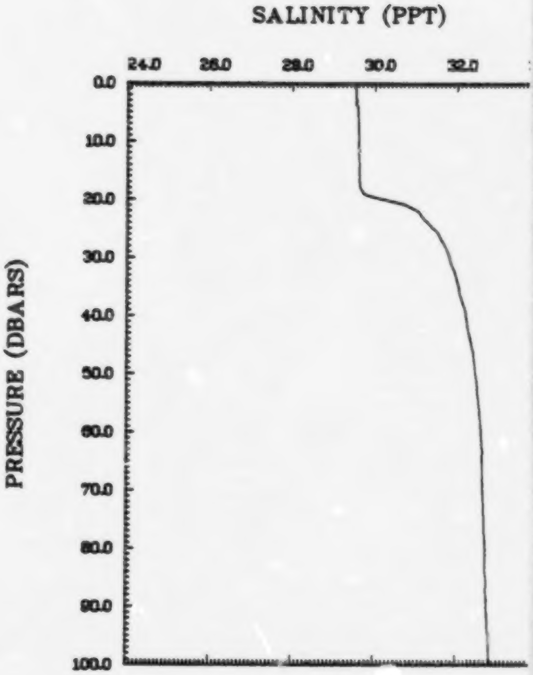
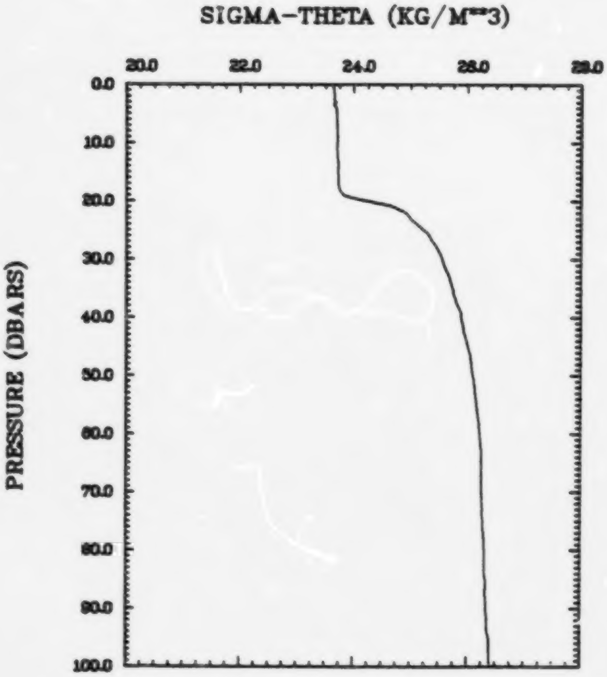
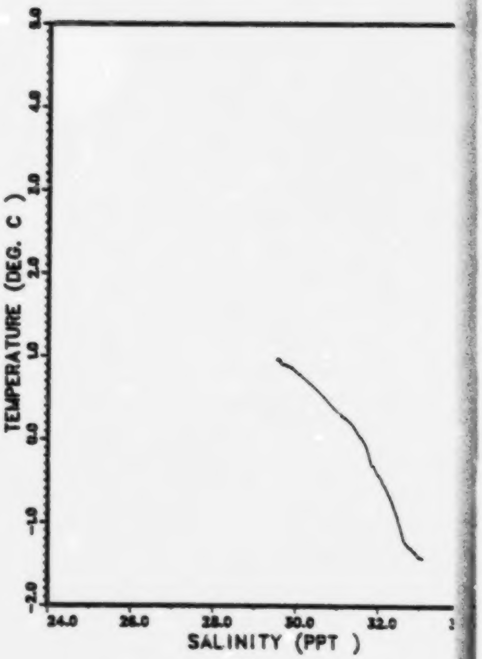
Lon. 69 40.0'W









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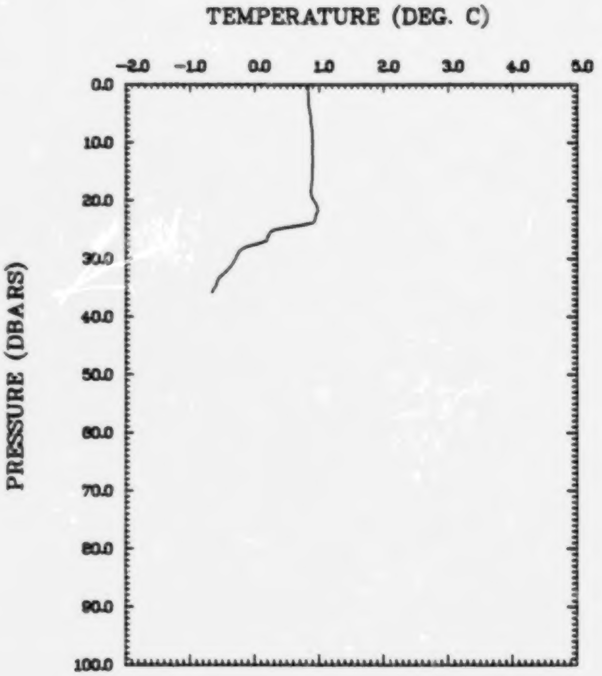
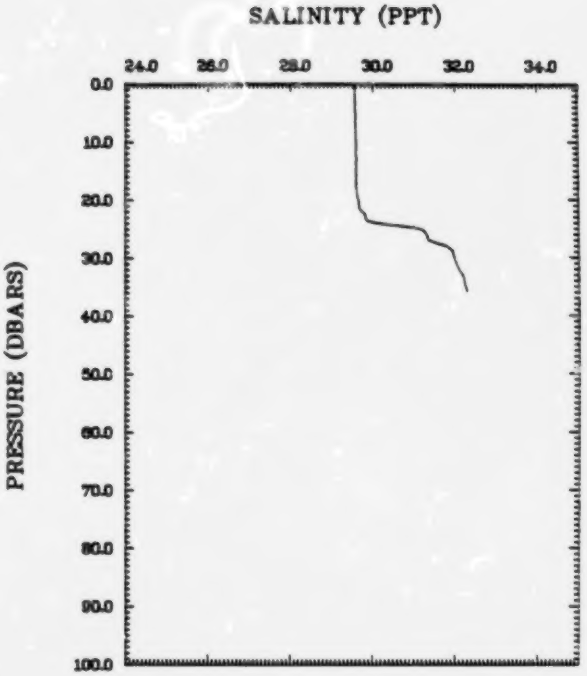
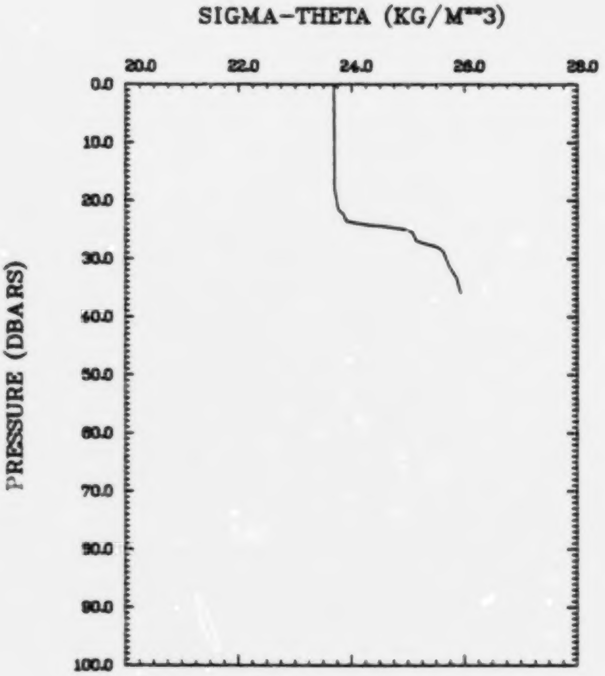
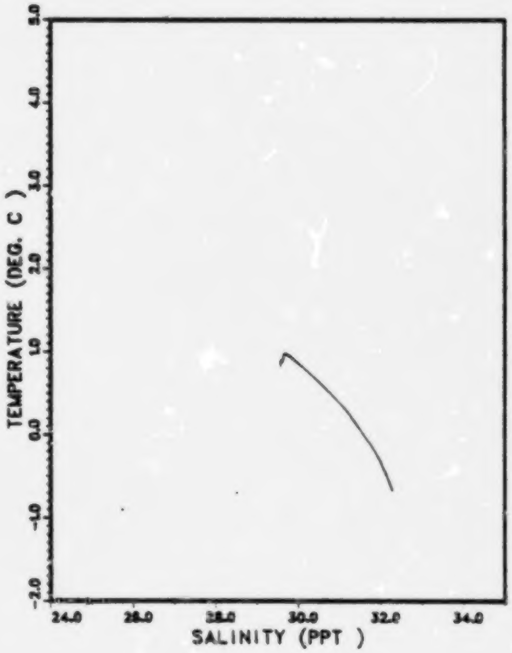
Lon. 69 28.0'W









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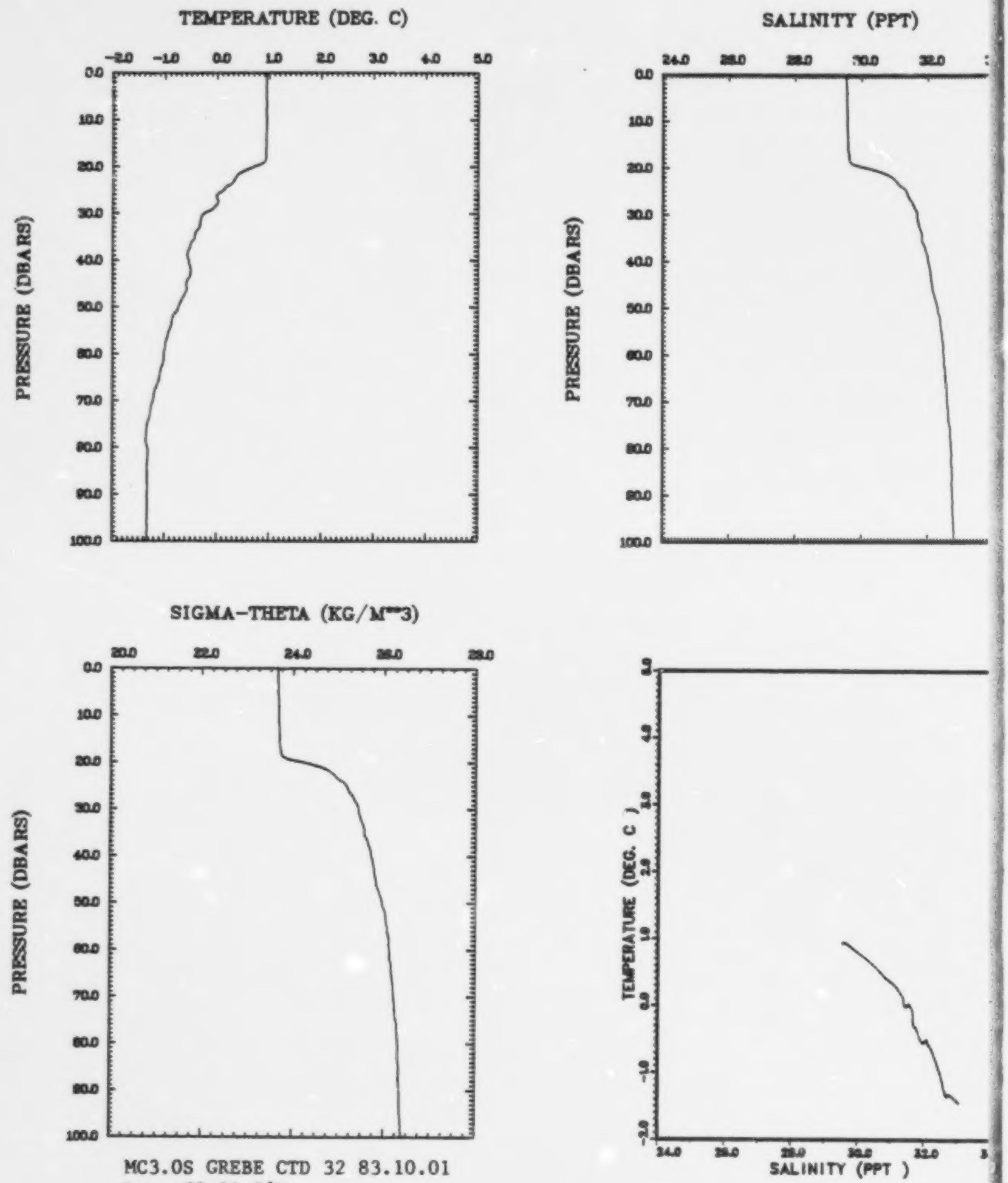
Lon. 69 25.8'W



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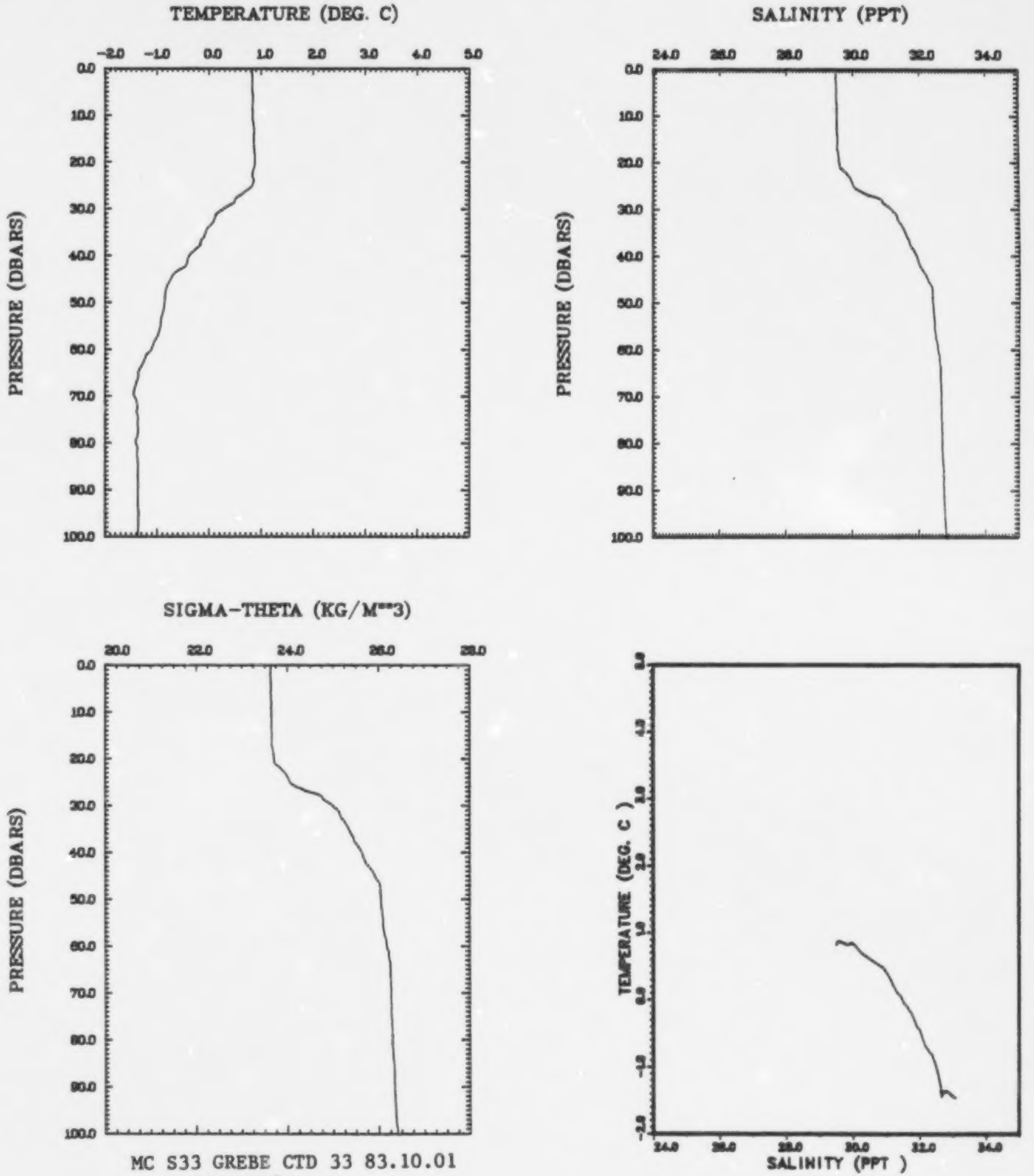
Lon. 69 15.2'W



TEMPERATURE (DEG. C)

SALINITY (PPT)

SIGMA-THETA (KG/M**3)

MC S33 GREBE CTD 33 83.10.01
Lat. 69 33.3'N
Lon. 69 2.4'W

OBSERVATIONS AT PANGNIRTUNG FIORD

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INTRODUCTION

Although Pangnirtung Fiord was not visited during SAFE '83 as originally planned, several observations pertinent to the sedimentology and oceanography of the fiord were made during a land-based operation earlier in the year. These follow from preliminary studies by Gilbert (1978), and are presented in this volume to provide information to assist in planning further research on fiord sedimentology in this area.

POLYNYA OVER THE SILL

Pangnirtung Fiord has a shallow sill at the mouth from 12 to 14 m below mean tide level except at the south where there is a notch to about 22 m below mean tide (Gilbert, 1978). Fig. 1 shows a portion of a bathymetric map of the sill area prepared during that study. The echo sounding shown in Fig. 2 suggests that the sill is probably a terminal moraine, although the relation to bedrock beneath is unknown, and the moraine does not appear to continue above sea level on the sides of the fiord nearby.

Fig. 3 shows that tidal currents passing over the sill are sufficient to allow a polynya to develop. At the time of photography on May 23, 1983 the main body of water either completely open or covered with broken ice measured about 3.7 km by 200 m. It can be seen in Fig. 1 that the polynya is completely open over the area where the sill is shallow, but is nearly closed over the deeper water where the notch occurs on the south side of the sill. The velocities of the tidal currents are unknown, but they may be estimated from consideration of the tidal prism and the cross sectional area above the sill ($8.80 \times 10^4 m^3$) as shown in Table 1. Tidal records are not available from Pangnirtung, but at Frobisher on May 23 the tidal range was 7.2 m (compared to mean tide of 9.7 m). Tides in May were below normal with highest range 9.5 m on May 15 and lowest 5.3 m on May 20.

Clearly, the estimates of velocity shown in Table 1 are only approximate, and they do not account for differences over the various portions of the sill which are at different depths. From the Frobisher data, it is probable that the current velocity on May 23 was about 0.3 to 0.35 m/s (cf. values of 0.5 to 1.0 m/s made by Sadler (1974a, b) for a similar polynya in Makinson Fiord, Ellesmere Island).

TABLE 1: CALCULATED FLOW OVER THE PANGNIRTUNG SILL

Tides	Tidal range (m)*	Tidal prism (m^3 x 10^8)	Estimated maximum discharge# (m^3/s x 10^4)	Estimated maximum current velocity (m/s)
Spring	6.68	7.35	5.14	0.58
Neap	2.70	2.97	2.08	0.24

* semidiurnal tides with mean period of 12.49 hours (Gilbert, 1978)

# at mid tide assuming the discharge over the sill follows a sine curve.

This polynya is only one of many along the highly indented coastline of Cumberland Sound. They are important hunting sites (Schledermann, 1980) and are described by a number of early travellers (for example, Hantzsch (Neatby, 1977) and Millward, 1930). They are known locally as sarbaks or sukpaws. Further work from Landsat imagery on the extent and time of development of these features is under way.

FORAMINIFERA IN THE SEDIMENTS

Preliminary analysis was made by C.S. Schafer and T. Cole of the content of foraminifera in samples of about 20 mL of sediment from 10 Ekman grabs recovered in 1977 from the head of Pangnirtung Fiord to the settlement of Pangnirtung by Gilbert (1978). Their findings are summarized here with permission. Fig. 4 refers to sample locations.

The population comprises nine calcareous species, 21 arenaceous species, and one thecamoebian species, (Urnulina difflugiformis). Planktonic specimens comprising 5.1 and 0.3% of the total population were observed at stations 6 and 12 respectively. The highest number of specimens per unit volume of wet sediment occurs in the deepest basins especially the one which reaches a maximum depth of 165 m west of the settlement.

The calcareous species are best represented to the west of the riegel nearest the head of the fiord (known locally as Aulativikjuaq). Urnulina difflungiformis also shows comparatively high concentrations in this area. However, its primary source is not clear. The basin south of the riegel could be trapping specimens carried from both the head of the fiord and/or from the smaller tributary stream to the east of the riegel.

The arenaceous species *Textularia torquata* is the most abundant taxon; its maximum percentage (56%) occurs at station 6 and it tends to be characteristic generally of the deep basin environments lying north and south of the riegel. There appears to be an ecological control of this relation since the basin just upfiord from Pangnirtung this foram comprises less than 10% of the sample.

Among the calcareous species, *Elphidium excavatum clavatum* is comparatively ubiquitous and, like some of the other key calcareous taxa, is well represented in the part of the upper basin adjacent to Aulativikjuaq.

Compared to the suite recoved from the fiords of eastern Baffin Island during SAFE '82, the numbers of foraminifera per unit volume of wet sediment are significantly lower in Pangnirtung Fiord on average. Unlike most of the suite from SAFE '82, *Textularia torquata* is more abundant in Pangnirtung compared to *Reophax arctica* and *Textularia earlandi*. *R. arctica* and *T. earlandi* are best represented at stations 5 and 8 respectively.

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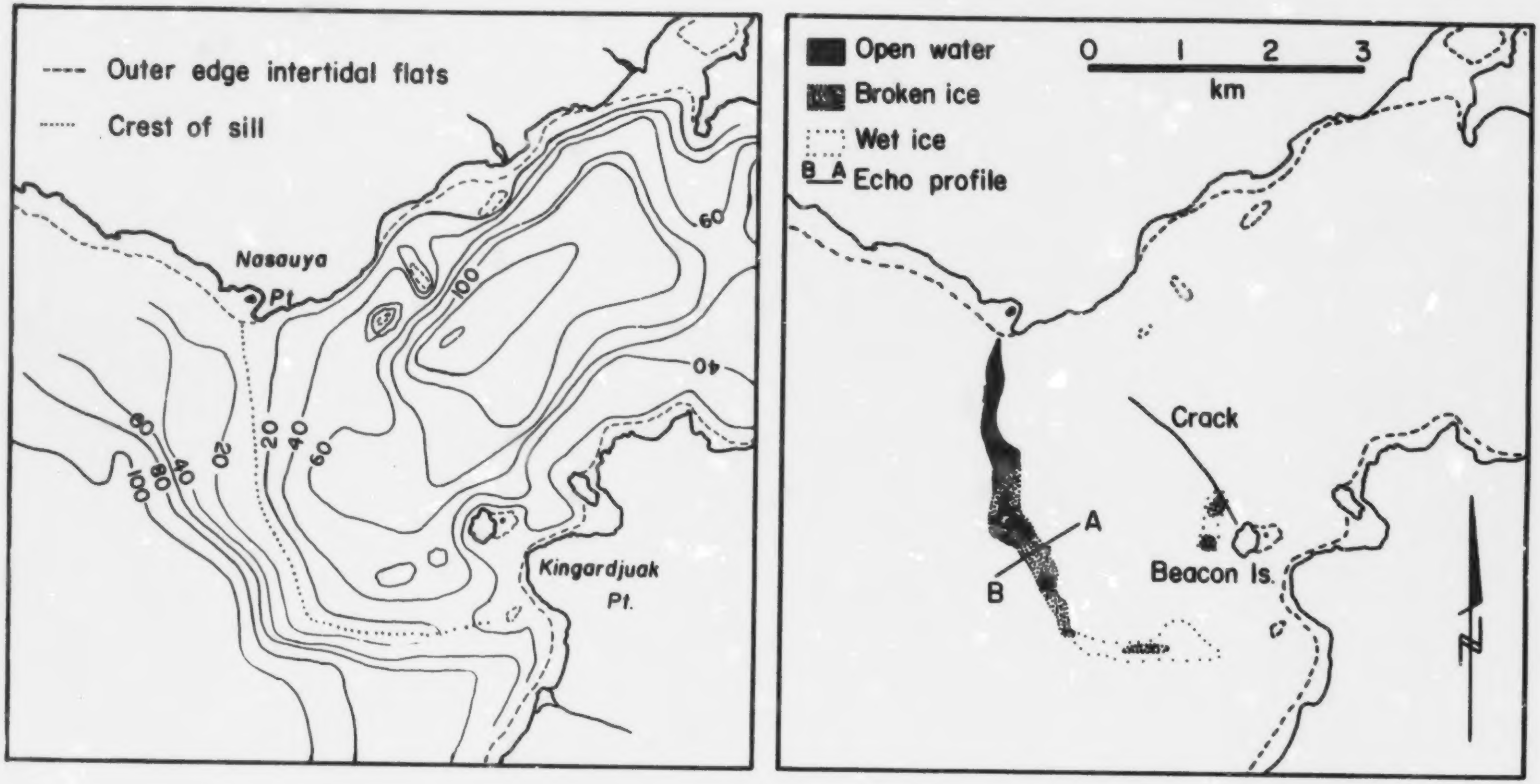

FIG. 1. Bathymetric map of the mouth of Pangnirtung Fiord showing the sill (from Gilbert, 1978), and location of the polynya mapped from photographs taken May 23, 1983.

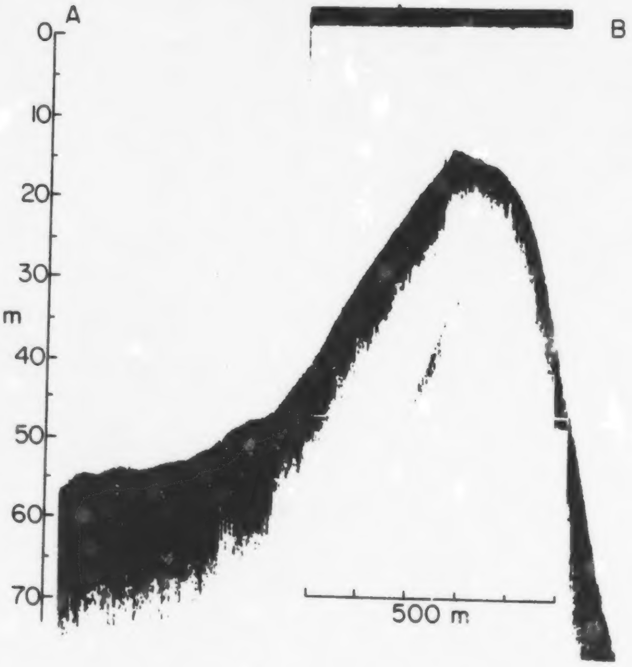

FIG. 2. Echogram over the sill in Pangnirtung Fiord, September 9, 1983. Location is shown in Figure 1.

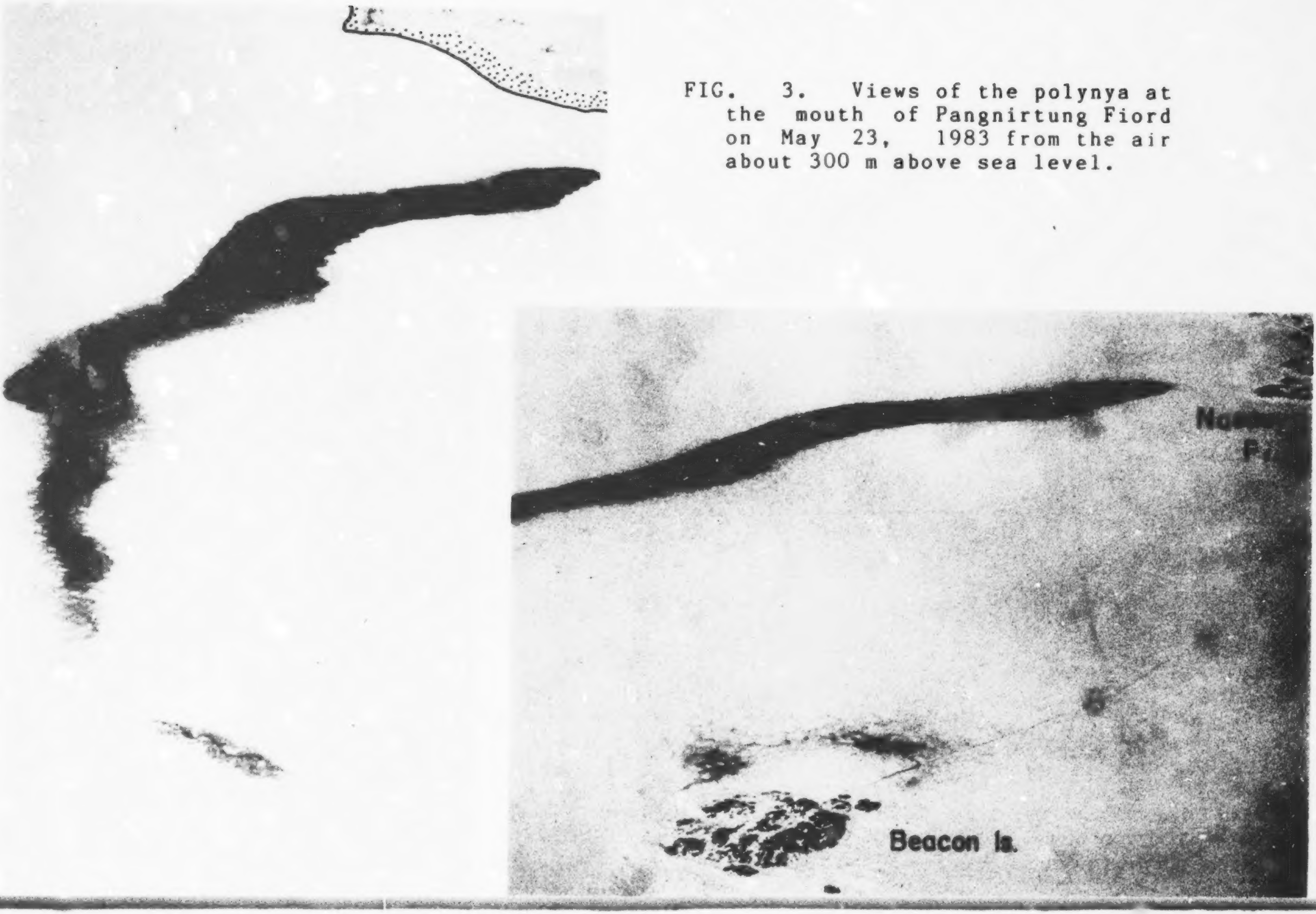

FIG. 3. Views of the polynya at the mouth of Pangnirtung Fiord on May 23, 1983 from the air about 300 m above sea level.

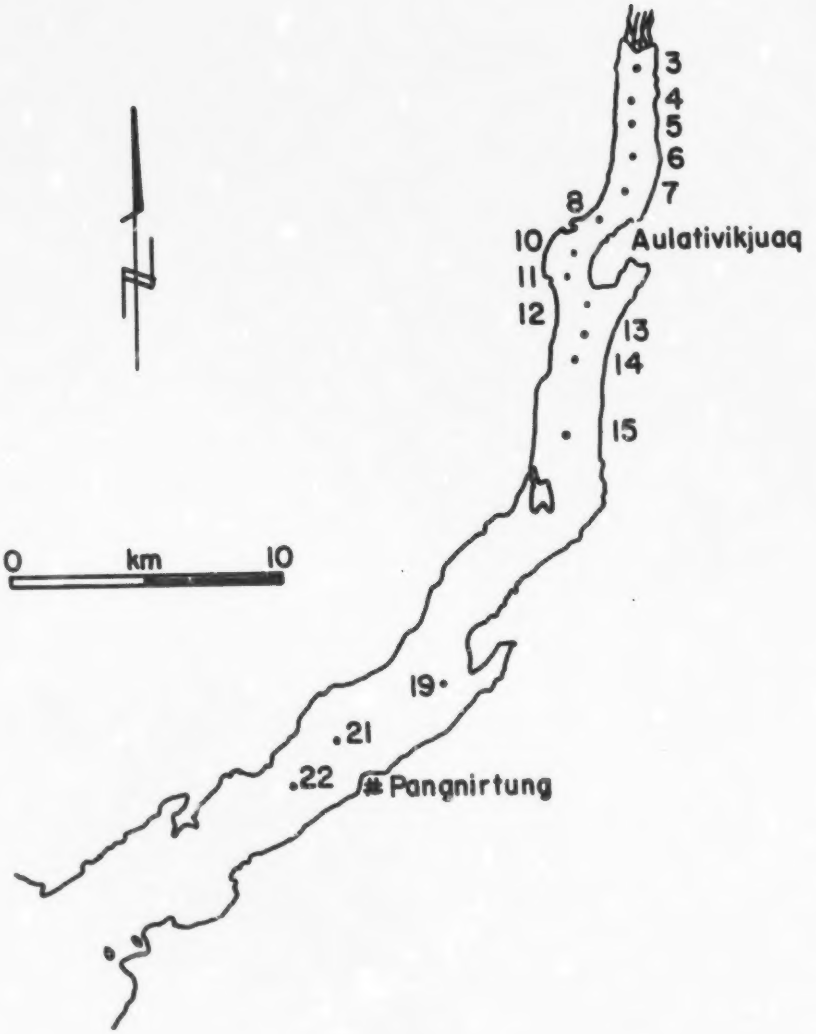

FIG. 4. Location of grab samples used in the preliminary examination of foraminifera in Pangnirtung Fiord.

SAFE: 1983 LIGHT ATTENUANCE AND SUSPENDED PARTICULATE MATTER DATA

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B2Y 4A2

The objectives of the light attenuance measurements and the suspended sediment collection and assessment are:

a) to determine the nature of the suspended sediment found during the autumn seasion in three eastern Baffin Island fiords, and

b) to determine the particle dynamics of the SPM (suspended particulate matter) concentrations.

On the C.S.S. Hudson a rosette sampler was coupled with a Guildline CTD. The rosette was fitted with 9 5-L Niskin sampling bottles. Water samples were taken at 5 to 9 depths during the up-cast. Sampling depths were selected after evaluating the attenuance profiles of the down-cast.

The attenuance profiles for all CTD stations are presented in figure 1 for Cambridge Fiord, in figure 2 for Itirbilung Fiord, and in figure 3 for McBeth Fiord. Attenuance measurements in Cambridge Fiord were made with 2 attenuance meters which were coupled with the Guildline CTD:

a) the Multi Spectral Beam Attenuance Meter (Larson, 1973 and Winters and Buckley, 1980) and

b) the 0.25 m Sea Tech Transmissometer (Bartz *et. al.*, 1978).

In Itirbilung Fiord and Mcbeth Fiord, only the Sea Tech Transmissometer was employed. All data are presented as attenuance per unit m cell (m^{-1}), at wavelength band 680 nm, and have been corrected for attenuance by water.

Water subsamples were drawn from the Niskin bottles through the sampler bottom insted of through the sampling spigot. A large diameter funnel was used to direct the water stream into the subsample bottle. The 1 L water sample was then vacuum filtered through 47 mm filers of 0.45 um pore size (these filters had been predried and preweighed). The filters with filtrate were washed with deionized water and dried in individual petri dishes. Upon return to our laboratory the filters were redried and weighed to determine the SPM mass. All SPM *in situ* concentrations are reported in table 1.

Data from water samples collected on HU82-031, the first SAFE cruise, also are included in this report: mineralogy and size distribution information. Portions of silver filters containing SPM filtrate were mounted with finger nail polish for semi-quantative mineral analysis for majors according to the procedures outlined in Syvitski and Bayliss (1980). The peak area of the mineral marker reflections were digitized and normalized to the total peak area of other marker reflections. No Lorentz polarization correction was yet undertaken. The category "other" given in Table 4-4 is composed primarily of garnet and pyroxene but also includes traces of tourmaline, siderite, magnetite and other heavy minerals. Many filters had too little sample (total peak area very low) and therefore percentages are not given.

Portions of the filters were blasted free of their filtrate particles in vials containing a hexametaphosphate electrolyte in a weak ultra sound bath. The solution with SPM was analyzed on a computerized Coulter Counter TAII using two overlapping aperature tubes (30 µm and 200 µm). Using a modified overlap program, moment statistics are calculated and frequency plots generated.

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TABLE 4.1 Concentration of Suspended Particulate Matter

Station	Depth (m)	SPM (mg L^{-1})	Yellow Tag #
Ca-0.2	1	1.43	8317563
	5	0.83	8317562
	10	0.82	8317561
	20	0.72	8317560
	30	0.75	8317559
	50	0.56	8317558
	75	0.67	8317557
	100	0.87	8317556
	119	0.86	8317555
Ca-1.0	1	0.96	8317545
	10	0.70	8317543
	35	0.61	8317541
	100	0.53	8317538
	165	0.77	8317537
Ca-1.2	1	0.84	8317554
	23	0.60	8317551
	53	0.45	8317550
	103	0.22	8317548
	193	0.90	8317546
Ca-2.0	1	0.32	8317590
	20	0.59	8317587
	50	0.55	8317585
	200	0.31	8317583
	315	0.55	8317582
Ca-2.2	1	0.38	8317581
	17	0.59	8317578
	45	0.53	8317577
	200	0.26	8317574
Ca-3.0	1	0.31	8317572
	20	0.22	8317570
	40	0.62	8317569
	220	0.25	8317565
	360	0.40	8317564
Ca-4.1	10	1.93	8317534
	30	0.56	8317532
	45	1.08	8317531
	100	0.92	8317530
	500	0.37	8317528
Ca-4.2	1	0.41	8317527
	5	0.69	8317526
	25	0.72	8317524
	45	0.91	8317523
	80	0.39	8317522
	105	0.53	8317521
Ca-5.0	1	0.73	8317608
	20	0.64	8317605
	70	0.85	8317604
	500	0.25	8317601
	580	0.40	8317600
Ca-5.1	1	0.73	8317617
	5	0.92	8317616
	30	0.64	8317614
	70	0.70	8317612
	480	0.30	8317609
Ca-6.0	1	0.60	8317599
	20	0.78	8317596
	60	0.96	8317595
	450	0.42	8317592
	658	0.41	8317591
Ca-6.1	5	1.76	8317517
	10	1.48	8317516
	20	1.47	8317515
	150	0.92	8317513
	200	0.61	8317512
Ca-7.1	1	1.98	8317509
	5	3.81	8317508
	10	2.84	8317507
	20	2.58	8317506
	51	2.15	8317505
	102	0.35	8317503
	303	1.27	8317502
Ca-9.0	5	0.39	8317626
	40	0.88	8317624
	50	0.89	8317623
	400	0.58	8317619
	645	0.57	8317618
It-0.1A	5	0.34	8317677
	10	0.45	8317676
	20	0.48	8317675
	30	0.39	8317674
	45	0.77	8317672
It-0.2	1	0.43	8317661
	20	0.58	8317658
	40	0.36	8317656
	75	0.69	8317654

TABLE 4.1(cont.)

Station	Depth (m)	SPM (mg L^{-1})	Yellow Tag #
It-0.3	5	0.18	8317670
	10	0.32	8317669
	20	0.75	8317668
	30	0.24	8317667
	135	0.32	8317663
It-1.1	5	1.22	8317652
	30	0.98	8317649
	40	1.00	8317648
	130	1.57	8317646
	250	1.24	8317645
It-1.2A	1	0.39	8317644
	20	0.23	8317642
	30	0.42	8317641
	200	0.11	8317637
	290	0.38	8317636
It-1.2B	1	0.22	8317689
	10	0.26	8317687
	20	0.44	8317686
	200	0.23	8317682
	273	0.53	8317681
It 2.1	1	0.31	8317707
	30	0.30	8317703
	50	0.39	8317702
	100	0.16	8317701
	330	0.33	8317699
It-2.2	1	0.28	8317698
	10	0.22	8317696
	20	0.49	8317695
	100	0.11	8317692
	387	0.32	8317690
It-2.3	1	0.13	8317716
	10	0.14	8317714
	20	0.20	8317713
	100	0.18	8317711
	395	0.62	8317708
It-3.1	5	0.76	8317724
	20	0.29	8317723
	30	0.46	8317722
	270	0.49	8317718
	345	0.22	8317717
It-6.0	5	0.32	8317634
	30	0.84	8317633
	40	0.43	8317632
	50	0.88	8317631
	535	0.84	8317627
Mc-0.1A	5	0.73	8317732
	20	0.74	8317730
	30	0.73	8317729
	50	1.45	8317728
	92	0.85	8317726
Mc-0.1C	1	0.80	8317752
	10	0.66	8317750
	50	0.38	8317748
	135	0.29	8317745
	175	0.54	8317744
Mc-2.0B	5	0.44	8317743
	50	0.39	8317739
	165	0.45	8317737
	250	0.48	8317736
	310	0.62	8317735
Mc-2.1B	5	0.33	8317660
	30	0.29	8317657
	50	0.08	8317656
	175	0.34	8317654
	308	0.25	8317653
Mc-3.05	1	0.19	8317779
	30	0.24	8317775
	100	0.21	8317774
	525	0.34	8317771
Mc-4.1C	1	0.14	8317770
	30	0.33	8317767
	40	0.41	8317766
	300	0.15	8317763
	530	0.17	8317762

TABLE 4.2 RELATIVE MINERAL ABUNDANCE
(Peak Area %)

Sample ID	Mica	Amphibole	Chlorite	Quartz	Feldspar	Ilmenite	Other
IN-1-1	70	-	-	-	29	-	-
IN-1-5	31	-	-	-	8	37	Garnet 21
IN-1-10	46	-	-	-	-	51	-
IN-1-20	49	-	-	-	-	53	-
IN-1-30	26	-	-	-	31	15	26
IN-1-50	77	-	-	-	-	22	-
IN-1-75	54	-	-	-	-	5	39
IN-1-100	28	-	-	-	-	16	54
IN-1-125	55	-	-	-	-	-	16 27 (hornblende)
IN-1-155	100	-	-	-	-	-	-
IN-2-1	68	-	-	-	-	31	-
IN-2-5	61	-	-	-	10	27	-
IN-2-10	100	-	-	-	-	-	-
IN-2-20	100	-	-	-	-	-	-
IN-2-30	100	-	-	-	-	-	-
IN-2-50	52	-	-	-	-	21	26
IN-2-75	100	-	-	-	-	-	-
IN-2-100	100	-	-	-	-	-	-
IN-2-200	69	-	-	-	-	-	30
IN-2-270	100	-	-	-	-	-	-
IN-3-1	65	-	-	-	-	34	-
IN-3-5	100	-	-	-	-	-	-
IN-3-10	54	-	-	-	15	30	-
IN-3-20	100	-	-	-	-	-	-
IN-3-30	70	-	-	-	5	24	-
IN-3-50	33	-	-	-	21	28	16
IN-3-100	39	-	-	-	-	19	40
IN-3-200	100	-	-	-	-	-	-
IN-3-400	20	-	-	-	5	13	60
IN-3-550	100	-	-	-	-	-	-
IN-4-1	12	-	-	-	17	70	-
IN-4-5	8	-	-	-	16	75	-
IN-4-10	29	-	-	-	38	-	32
IN-4-20	27	-	-	-	25	47	-
IN-4-30	36	-	-	-	-	-	63
IN-4-50	14	5	-	-	37	42	-
IN-4-100	56	-	-	-	30	12	-
IN-4-200	12	-	-	-	12	75	-

Table 4.2 Cont'd

Sample ID	Mica	Amphibole	Chlorite	Quartz	Feldspar	Ilmenite	Other
IN-4-400	23	-	-	-	30	45	-
IN-4-550	85	-	-	-	4	7	3
IN-5-1	8	-	-	-	12	79	-
IN-5-100	25	-	-	-	18	47	9
IN-6-1	33	-	-	-	-	66	-
IN-6-5	48	-	-	-	51	-	-
IN-6-10	27	-	-	-	24	48	-
IN-6-20	-	-	-	-	29	70	-
IN-6-30	35	-	-	-	27	37	-
IN-6-50	-	-	-	-	19	67	12
IN-6-75	21	-	-	-	-	15	62
IN-6-100	15	-	-	-	-	46	38
IN-6-200	24	-	-	-	-	16	59
IN-6-260	54	-	-	-	23	-	22
IN-7-1	44	15	-	-	14	25	-
IN-7-5	24	-	-	-	22	53	-
IN-7-10	-	-	-	-	27	72	-
IN-7-20	27	-	-	-	16	36	19
IN-7-30	19	-	-	-	8	53	17
IN-7-50	-	-	-	-	14	66	19
IN-7-100	23	-	-	-	33	42	-
IN-7-200	-	-	-	-	17	35	30
IN-7-300	39	-	-	-	17	38	4
IN-7-378	72	-	-	-	-	27	-
IN-8-1	67	7	-	2	11	7	3
IN-8-5	58	-	-	-	18	22	-
IN-8-10	49	5	4	-	13	26	-
IN-8-20	52	3	-	4	12	26	-
IN-8-30	58	-	-	-	15	18	8
IN-8-50	41	-	-	-	17	28	12
IN-8-100	77	-	-	-	22	-	-
IN-8-200	69	-	-	-	7	13	9
IN-8-300	66	-	-	-	18	5	9
IN-8-325	53	8	-	-	3	14	19
MC-8-1	-	-	-	-	26	73	-
MC-8-5	-	-	-	-	35	64	-
MC-8-10	-	-	-	-	-	100	-
CA-1-5	20	-	-	-	17	61	-
CA-1-10	7	-	-	-	31	60	-
CA-1-20	-	-	-	-	22	77	-
CA-1-30	-	-	-	-	34	43	21
CA-1-50	12	-	-	-	30	39	16

Table 4.2 Cont'd

Sample ID	Mica	Amphibole	Chlorite	Quartz	Feldspar	Ilmenite	Other
CA-1-75	52	-	-	-	14	33	-
CA-1-100	-	-	-	-	37	62	-
CA-1-150	49	-	-	-	16	20	12
CA-1-185	47	-	24	-	-	27	-
IT-2-D	76	-	6	2	6	8	-
IT-3-D	42	-	22	-	18	16	-
TI-D-1C	69	-	2	19	4	4	-
TI-D-1D	44	-	-	28	7	20	-

Table 4.3 - Grain Size Data

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (Ø)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
CO-1	1	0.30	99.70	71.27	28.43	6.63	1.88	-0.55	1.85
	5	0.18	99.82	43.32	56.50	8.05	1.61	-0.46	2.14
	10	0.00	100.00	56.89	43.11	7.48	1.79	-0.10	1.76
	20	0.24	99.76	48.46	51.30	7.90	1.59	-0.33	2.10
	30	0.36	99.64	57.55	42.09	7.43	1.74	-0.04	1.79
	50	0.48	99.52	51.94	47.57	7.74	1.61	-0.26	2.11
	75	0.54	99.46	54.82	44.63	7.58	1.70	-0.18	1.95
	92	0.48	99.52	56.73	42.79	7.56	1.67	-0.14	1.99
CO-2	1	0.24	99.76	52.48	47.28	7.65	1.89	-0.15	1.72
	5	0.18	99.82	45.55	54.27	7.95	1.86	-0.33	1.76
	10	0.42	99.58	41.58	57.99	8.13	1.81	-0.53	2.10
	20	0.18	99.82	43.26	56.56	8.00	1.78	-0.50	2.06
	30	0.48	99.52	40.59	58.93	8.13	1.73	-0.55	2.25
	50	0.48	99.52	55.14	44.38	7.65	1.96	-0.02	1.62
	75	0.42	99.58	55.82	43.75	7.49	1.87	-0.06	1.72
	100	0.06	99.94	54.12	45.80	7.72	1.75	-0.08	1.81
	200	0.36	99.64	63.28	36.35	7.17	1.87	0.20	1.75
	225	0.79	99.21	61.34	37.87	7.24	1.88	0.14	1.75
CO-3	1	0.42	99.58	60.82	38.75	7.36	1.88	0.12	1.72
	10	0.24	99.76	40.58	59.17	8.14	1.70	-0.57	2.25
	20	0.30	99.70	64.32	35.38	7.21	1.87	0.30	1.75
	30	0.42	99.58	55.02	44.55	7.64	1.73	-0.06	1.85
	50	0.73	99.27	58.52	40.75	7.48	1.83	0.05	1.81
	75	2.00	98.00	59.80	38.21	7.34	1.84	-0.01	1.94
	100	1.94	98.06	74.96	23.11	6.39	1.86	0.69	2.23
	150	3.02	96.98	68.61	28.37	6.57	2.03	0.46	1.84
	200	0.30	99.70	51.39	48.31	7.84	1.83	-0.22	1.87
	250	0.36	99.64	63.56	36.08	7.10	1.95	0.15	1.73
CO-4	1	1.57	98.43	52.55	45.87	7.52	2.15	-0.05	1.48
	5	0.24	99.76	54.67	45.09	7.62	1.97	0.00	1.53
	10	0.85	99.15	43.13	56.02	8.05	2.00	-0.43	1.80
	20	0.30	99.70	52.72	46.97	7.88	1.78	-0.10	1.76
	30	0.97	99.03	61.29	37.75	7.28	2.14	0.24	1.55
	50	1.09	98.91	65.32	33.59	7.18	1.82	0.27	1.94
	100	0.48	99.52	66.06	33.46	7.18	1.91	0.32	1.82
	200	1.51	98.49	63.55	34.94	7.18	1.82	0.17	1.89
	300	0.30	99.70	65.09	34.61	7.15	1.87	0.29	1.82
	352	1.87	98.13	65.13	33.00	6.92	1.94	0.27	1.79
CO-5	1	0.66	99.34	75.76	23.58	6.58	1.70	0.58	2.25
	5	0.97	99.03	66.71	32.32	6.91	1.90	0.40	1.75
	10	0.78	99.22	68.19	31.03	7.06	1.65	0.29	2.04
	20	0.66	99.34	65.67	33.66	7.00	1.86	0.27	1.74

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
CO-5	20	0.66	99.34	65.67	33.66	7.00	1.86	0.27	1.74
	30	1.03	98.97	76.02	22.95	6.75	1.57	0.57	2.46
	50	0.84	99.16	77.94	21.22	6.41	1.68	0.63	2.30
	100	1.03	98.97	74.55	24.42	6.62	1.74	0.56	2.17
	200	1.15	98.85	81.21	17.64	6.43	1.52	0.72	2.75
	400	0.42	99.58	70.57	29.01	6.93	1.66	0.41	2.03
	497	1.15	98.85	67.65	31.21	6.98	1.73	0.26	1.95
CO1D-B		1.8	98.2	42.9	55.4	8.01	1.57	-0.77	3.15
CO2-D		1.3	98.7	49.9	48.9	7.71	1.78	-0.36	2.05
CO4D-A		0.7	99.3	46.5	52.8	7.99	1.49	-0.47	2.65
CO4D-B		0.7	99.3	64.2	35.2	7.39	1.52	0.00	2.29
CO5-D		3.6	96.4	70.9	25.4	6.63	1.77	0.25	1.99
CO7-D		2.2	97.8	61.0	36.6	7.04	1.86	-0.06	1.73
CO8-D		0.7	99.3	85.4	14.0	6.16	1.50	0.82	2.89
CO11-D-B		0.2	99.8	38.0	61.8	8.31	1.26	-0.58	3.14
CO12D-A		0.2	99.8	48.8	51.0	7.96	1.43	-0.47	2.81
MA-1	1	0.9	99.1	64.1	35.0	7.18	1.75	0.19	1.89
	5	0.5	99.5	65.9	33.5	7.03	1.80	0.22	1.84
	10	0.6	99.4	61.4	38.0	7.24	1.74	0.09	1.80
	20	1.0	99.0	58.8	40.2	7.29	1.81	0.00	1.75
	30	0.8	99.2	54.3	44.8	7.54	1.72	-0.19	1.91
	50	0.8	99.2	63.3	35.9	7.14	1.78	0.12	1.82
	75	1.6	98.4	60.1	38.3	7.29	1.76	0.00	1.89
MA-2	1	0.4	99.6	70.0	29.5	6.92	1.70	0.42	1.92
	5	0.7	99.3	68.4	31.0	6.89	1.76	0.30	1.88
	10	1.0	99.0	30.5	68.5	8.21	1.87	-0.91	2.52
	20	1.2	98.8	50.0	48.8	7.66	1.78	-0.36	1.98
	30	0.2	99.8	55.8	44.0	7.43	1.78	-0.11	1.76
	50	2.2	97.8	56.3	41.5	7.26	1.90	-0.08	1.74
	75	2.8	97.8	65.7	31.5	6.82	1.87	0.27	1.83
	100	0.8	99.8	64.4	34.8	7.18	1.69	0.09	1.91
	200	0.7	99.3	70.1	29.2	6.98	1.65	0.33	2.07
	254	0.5	99.5	49.5	49.9	7.76	1.68	-0.35	2.06
MA-4	1	0.4	99.6	62.2	37.40	7.21	1.79	0.07	1.78
	5	2.8	97.2	81.8	15.3	5.85	1.70	1.10	3.07
	10	0.4	99.6	76.5	23.1	6.57	1.70	0.64	2.27
	20	3.1	96.9	87.5	9.4	5.62	1.45	1.38	4.27
	30	1.9	98.1	68.4	29.6	6.74	1.85	0.37	1.84
	50	0.3	99.7	65.1	34.6	7.15	1.71	0.16	1.88
	100	1.4	98.6	77.1	21.6	6.45	1.69	0.60	2.27
	200	1.3	98.7	76.1	22.6	6.50	1.69	0.56	2.20
	300	0.4	99.6	70.1	29.6	6.88	1.70	0.30	1.93
	320	1.6	98.4	69.0	29.4	6.78	1.80	0.33	1.88

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
MA-5	1	0.2	99.8	77.3	22.5	6.73	1.54	0.70	2.54
	5	0.7	99.7	72.5	26.8	6.90	1.59	0.43	2.23
	10	1.2	98.8	73.6	25.2	6.82	1.64	0.46	2.28
	20	0.9	99.1	74.0	25.1	6.96	1.60	0.40	2.36
	30	0.3	99.7	76.0	23.7	6.77	1.59	0.59	2.38
	50	0.5	99.5	72.5	26.9	6.89	1.65	0.45	2.17
	100	0.8	99.2	73.3	25.8	6.77	1.66	0.40	2.16
	200	2.2	97.8	75.6	22.2	6.60	1.65	0.48	2.35
	400	0.4	99.6	75.2	24.5	6.63	1.75	0.61	2.19
	576	0.9	99.1	67.9	31.2	6.98	1.73	0.22	1.95
MA-6A	1	0.70	99.3	85.0	14.3	5.80	1.72	0.32	2.09
	10	1.45	98.55	75.49	23.06	6.59	1.70	0.56	2.26
	20	1.51	98.49	66.55	31.94	7.07	1.68	0.14	2.04
	30	0.18	99.82	59.68	40.13	7.45	1.70	0.04	1.82
	50	0.42	99.58	74.25	25.33	6.78	1.60	0.45	2.21
	100	1.88	98.12	68.29	29.83	6.93	1.72	0.25	2.05
	200	0.48	99.52	77.78	21.74	6.69	1.51	0.61	2.49
	400	0.60	99.40	78.50	20.90	6.63	1.52	0.57	2.48
	600	0.66	99.34	77.92	21.41	6.76	1.47	0.54	2.58
	640	0.54	99.46	77.16	22.30	6.73	1.54	0.51	2.42
MA-7	1	0.90	99.10	75.5	23.6	6.85	1.52	0.42	2.44
	5	0.60	99.40	65.4	34.0	7.22	1.63	0.09	2.05
	10	1.0	99.00	62.2	36.8	7.34	1.63	-0.02	2.09
	20	0.3	99.70	62.1	37.6	7.28	1.69	0.06	1.91
	30	1.9	98.10	63.7	34.4	7.13	1.71	0.11	1.99
	50	0.4	99.60	66.4	33.1	7.11	1.71	0.21	1.95
	100	0.2	99.80	67.3	32.4	7.36	1.68	0.05	1.94
	200	0.9	99.10	60.4	38.7	7.32	1.67	0.04	1.93
	400	0.54	99.46	64.73	34.73	7.24	1.62	0.11	2.01
	575	0.24	99.76	67.33	32.43	7.14	1.65	0.21	1.99
SU-1	1	0.24	99.76	67.93	31.82	7.14	1.64	0.21	2.04
	5	0.24	99.76	64.63	35.12	7.28	1.64	0.09	2.00
	10	1.45	98.55	67.79	30.76	7.03	1.71	0.14	2.04
	20	0.48	99.52	62.69	36.83	7.38	1.67	-0.01	2.04
	30	0.18	99.82	56.26	43.56	7.51	1.78	-0.11	1.79
	50	2.23	97.77	67.72	30.05	6.99	1.71	0.15	2.06
	75	0.79	99.21	70.49	28.72	6.90	1.70	0.23	2.00
	100	1.39	98.61	64.24	34.38	7.10	1.74	0.08	1.90
	150	0.30	99.70	75.11	24.59	6.76	1.60	0.45	2.20
	200	1.15	98.85	76.59	22.26	6.67	1.60	0.54	2.37
SU-5	1	1.03	98.97	68.96	30.01	7.13	1.57	0.20	2.23
	5	0.60	99.40	73.65	25.75	6.90	1.59	0.33	2.23
	10	2.84	97.16	71.77	25.39	6.82	1.69	0.25	2.20

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\bar{X}$ ϕ	σ ϕ	Sk	Kurt
SU-5	20	0.96	99.04	69.90	29.13	7.05	1.66	0.17	2.14
	30	0.67	99.33	76.09	23.25	6.69	1.67	0.38	2.21
	50	1.03	98.97	73.05	25.93	6.90	1.61	0.28	2.22
	75	0.30	99.70	75.45	24.25	6.84	1.53	0.43	2.29
	100	0.54	99.46	69.16	30.29	7.02	1.63	0.21	2.01
	150	0.48	99.52	69.21	30.30	6.89	1.78	0.36	1.87
SU-6	1	0.91	99.09	73.07	26.02	6.85	1.63	0.34	2.17
	5	0.97	99.03	76.82	22.22	6.72	1.56	0.50	2.41
	10	0.48	99.52	68.55	30.96	7.17	1.55	0.14	2.22
	20	1.09	98.91	73.57	25.34	6.93	1.54	0.35	2.34
	30	0.66	99.34	68.78	30.55	7.24	1.50	0.20	2.31
	50	1.99	98.01	65.55	32.46	7.09	1.72	0.10	2.03
	75	1.15	98.85	72.76	26.09	6.76	1.71	0.33	2.07
	100	0.67	99.33	81.12	18.21	6.56	1.46	0.58	2.61
	150	0.24	99.76	75.36	24.40	6.88	1.50	0.37	2.28
SU-7	1	1.03	98.97	68.08	30.89	7.11	1.61	0.17	2.13
	5	0.48	99.52	70.52	29.00	7.04	1.61	0.18	2.13
	10	2.66	97.34	70.72	26.63	6.87	1.65	0.23	2.20
	20	0.97	99.03	73.43	25.61	6.91	1.57	0.28	2.27
	30	1.21	98.79	68.59	30.21	7.16	1.57	0.11	2.28
	50	0.84	99.16	80.55	18.60	6.61	1.47	0.61	2.73
	57	0.67	99.33	83.62	15.72	6.49	1.42	0.72	3.01
SU-8	1	0.60	99.40	72.58	26.82	7.01	1.52	0.27	2.29
	5	0.24	99.76	73.86	25.90	7.02	1.49	0.30	2.35
	10	0.48	99.52	70.38	29.14	7.14	1.50	0.27	2.27
	20	0.24	99.76	67.17	32.59	7.31	1.51	0.19	2.21
	30	0.24	99.76	72.16	27.15	7.04	1.52	0.33	2.30
	50	1.51	98.49	74.41	24.08	6.78	1.60	0.41	2.32
	75	1.39	98.61	73.52	25.09	6.81	1.64	0.36	2.20
	100	0.12	99.88	55.34	44.54	7.66	1.51	-0.25	2.25
	150	0.60	99.40	72.29	27.11	6.99	1.55	0.33	2.24
	155	1.69	98.31	78.63	19.68	6.50	1.61	0.56	2.45
Itirbilung	42	0.60	99.40	65.52	33.87	7.19	1.67	0.15	1.97
Delta	43	0.72	99.28	65.26	34.02	7.22	1.64	0.10	2.03
IT-1	1	1.57	98.43	66.96	31.47	6.98	1.79	0.14	1.93
	5	0.79	99.21	68.16	31.05	7.04	1.68	0.20	1.98
	10	0.24	99.76	67.19	32.57	7.12	1.68	0.16	1.95
	20	0.24	99.76	72.91	26.85	6.91	1.61	0.38	2.17
	30	0.24	99.76	61.46	38.30	7.31	1.56	-0.09	1.97
	40	0.73	99.27	65.78	33.50	7.15	1.66	0.17	1.96
	50	0.60	99.40	67.38	32.01	7.11	1.66	0.17	2.03
	75	0.24	99.76	74.18	25.58	6.79	1.63	0.49	2.19

WATER SAMPLES			SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)		
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
IT-1	100 145	0.60	99.40	64.09	35.31	7.23	1.66	0.04	1.98
IT-2	1	0.36	99.64	74.64	25.00	6.70	1.71	0.46	2.14
	5	1.99	98.01	75.48	22.54	6.64	1.64	0.52	2.34
	10	0.30	99.70	73.15	26.55	6.82	1.66	0.39	2.11
	20	0.42	99.58	82.39	17.19	6.46	1.50	0.87	2.99
	30	0.30	99.70	83.02	16.67	6.49	1.42	0.92	3.18
	50	3.45	96.55	69.38	27.17	6.70	1.81	0.34	1.98
	75	1.75	98.25	68.23	30.02	6.72	1.88	0.34	1.79
	100	0.36	99.64	79.08	20.56	6.54	1.57	0.62	2.42
	200	0.30	99.70	62.82	36.88	7.26	1.72	0.01	1.88
	305	0.24	99.76	68.63	31.13	7.13	1.56	0.15	2.09
IT-3	1	0.36	99.64	68.14	31.50	6.88	1.83	0.29	1.80
	5	0.30	99.70	68.03	31.67	7.11	1.68	0.15	1.99
	10	0.60	99.40	69.21	30.19	6.95	1.75	0.32	1.94
	20	0.30	99.70	62.07	37.63	7.32	1.71	0.01	1.92
	30	1.39	98.61	76.40	22.20	6.61	1.66	0.57	2.40
	50	0.85	99.15	74.61	24.54	6.65	1.73	0.63	2.23
	100	0.42	99.58	75.39	24.19	6.65	1.68	0.42	2.09
	200	1.21	98.79	70.66	28.13	6.91	1.65	0.25	2.11
	300	0.78	99.22	68.89	30.32	7.06	1.61	0.24	2.09
	405	0.60	99.40	76.42	22.97	6.74	1.50	0.54	2.39
IT-4	1	1.45	98.55	68.27	30.28	6.88	1.80	0.25	1.92
	5	1.27	98.73	68.30	30.43	7.02	1.68	0.30	2.07
	10	0.84	99.16	65.84	33.32	7.23	1.58	0.11	2.14
	20	0.24	99.76	67.23	32.53	7.24	1.54	0.15	2.15
	30	0.97	99.03	71.55	27.49	7.01	1.55	0.35	2.30
	50	1.63	98.37	72.47	25.90	6.86	1.62	0.43	2.32
	75	1.09	98.91	73.69	25.22	6.82	1.59	0.46	2.29
	100	0.48	99.52	72.89	26.63	6.95	1.55	0.48	2.27
	200	0.84	99.16	75.56	23.59	6.75	1.56	0.46	2.32
	290	0.24	99.76	68.53	31.23	7.12	1.57	0.26	2.05
MC-1	1	0.54	99.46	60.80	38.66	7.32	1.76	0.13	1.79
	5	0.42	99.58	62.38	37.19	7.25	1.67	0.08	1.88
	10	0.67	99.33	60.08	39.25	7.39	1.65	-0.07	2.01
	20	1.09	98.91	56.84	42.07	7.36	1.83	-0.04	1.74
	30	0.36	99.64	71.75	27.89	6.79	1.71	0.41	1.98
	50	0.24	99.76	56.49	43.27	7.62	1.62	-0.30	2.22
	75	1.15	98.85	66.02	32.83	7.22	1.62	-0.04	2.14
	100	0.48	99.52	53.68	45.83	7.73	1.60	-0.25	2.17
	200	0.24	99.76	66.86	32.90	7.19	1.57	0.09	2.08
	312	0.24	99.76	56.63	43.13	7.54	1.59	-0.18	2.04

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
MC-3	1	0.54	99.46	65.52	33.94	7.07	1.76	0.26	1.82
	5	1.51	98.49	62.38	36.11	7.12	1.81	0.05	1.84
	10	0.24	99.76	53.75	46.00	7.56	1.77	-0.17	1.77
	20	0.79	99.21	52.78	46.43	7.57	1.75	-0.28	1.96
	30	1.15	98.85	59.95	38.90	7.35	1.69	-0.09	1.96
	50	1.03	98.97	67.34	31.63	7.21	1.55	0.07	2.21
	100	0.36	99.64	68.50	31.14	7.13	1.58	0.21	2.06
	200	0.30	99.70	63.69	36.01	7.35	1.57	-0.01	2.10
	300	0.30	99.70	66.96	32.74	7.24	1.52	0.14	2.13
	435	0.24	99.76	72.26	27.49	7.03	1.49	0.26	2.24
MC-4	1	0.30	99.70	71.11	28.59	6.80	1.75	0.37	1.94
	5	0.79	99.21	70.08	29.14	6.91	1.68	0.31	2.04
	10	0.72	99.28	71.81	27.47	6.85	1.67	0.44	2.10
	20	0.72	99.28	70.69	28.59	6.97	1.68	0.40	2.10
	30	0.42	99.58	64.80	34.78	7.23	1.66	0.16	1.95
	50	0.24	99.76	62.82	36.93	7.33	1.67	0.03	1.95
	100	0.24	99.76	61.45	38.30	7.39	1.61	0.04	1.97
	200	0.54	99.46	59.93	39.52	7.31	1.70	-0.10	1.90
	400	0.60	99.40	62.54	36.86	7.23	1.74	0.03	1.88
	520	0.91	99.09	65.00	34.09	7.21	1.61	0.05	2.08
MC-6	1	0.24	99.76	71.76	28.00	7.00	1.56	0.34	2.16
	5	0.42	99.58	67.10	32.48	7.15	1.61	0.16	2.05
	10	1.09	98.91	70.38	28.53	6.94	1.62	0.27	2.12
	20	0.24	99.76	72.08	27.67	6.99	1.54	0.34	2.21
	30	0.30	99.70	74.48	25.21	6.90	1.55	0.53	2.35
	50	0.24	99.76	74.65	25.11	6.91	1.54	0.51	2.37
	100	0.54	99.46	74.27	25.19	6.85	1.54	0.47	2.33
	200	0.24	99.76	70.43	29.32	7.09	1.53	0.35	2.16
	300	0.24	99.76	61.35	38.41	7.37	1.62	0.05	1.92
	380	0.24	99.76	62.18	37.58	7.39	1.54	-0.01	2.08
MC-7	1	0.24	99.76	71.00	28.76	7.02	1.56	0.30	2.14
	5	0.67	99.33	69.95	29.38	7.04	1.57	0.30	2.18
	10	0.60	99.40	77.82	21.58	6.70	1.51	0.55	2.48
	20	1.21	98.79	78.67	20.12	6.62	1.50	0.59	2.60
	30	0.79	99.21	74.59	24.63	6.79	1.61	0.53	2.29
	50	0.30	99.70	79.24	20.46	6.66	1.52	0.61	2.59
	100	0.30	99.70	77.88	21.82	6.70	1.52	0.66	2.53
	200	0.84	99.16	72.13	27.03	6.91	1.62	0.37	2.19
	400	0.30	99.70	61.79	37.90	7.28	1.66	0.02	1.88
	490	0.54	99.46	65.87	33.58	7.20	1.60	-0.01	2.10
MC-8	1	0.78	99.22	71.87	27.34	6.94	1.64	0.23	2.18
	5	0.30	99.70	75.46	24.23	6.82	1.56	0.37	2.27
	10	0.73	99.27	70.17	29.40	6.99	1.61	0.23	2.11

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
MC-8	20	0.54	99.46	67.56	31.89	7.21	1.52	0.15	2.19
	30	1.81	98.19	84.62	13.56	6.24	1.44	0.82	3.13
	50	0.36	99.64	81.35	18.28	6.43	1.53	0.78	2.74
	75	0.30	99.70	74.74	24.96	6.82	1.58	0.58	2.32
	100	0.30	99.70	72.79	26.90	6.81	1.68	0.46	2.11
	200	0.30	99.70	74.57	25.13	6.79	1.59	0.40	2.21
	287	0.48	99.52	66.85	32.67	7.17	1.59	0.08	2.09
MC-9	1	0.42	99.58	68.94	30.63	7.03	1.61	0.29	2.03
	5	0.30	99.70	67.70	31.99	7.10	1.62	0.23	1.98
	10	0.24	99.76	68.72	31.04	7.11	1.58	0.14	2.09
	20	0.90	99.10	64.33	34.76	7.20	1.66	0.15	1.97
	30	0.54	99.46	72.14	27.32	6.82	1.68	0.35	2.06
	50	0.30	99.70	74.35	25.35	6.84	1.56	0.47	2.27
	75	0.30	99.70	82.89	16.81	6.52	1.40	0.99	3.32
	100	0.60	99.40	81.77	17.62	6.60	1.40	0.83	3.11
	200	0.90	99.10	64.83	34.27	7.19	1.62	0.11	2.05
	305	0.54	99.46	70.79	28.66	7.01	1.56	0.32	2.17
MC-11	1	0.24	99.76	73.07	26.69	6.99	1.53	0.27	2.25
	5	0.18	99.82	62.72	37.10	7.45	1.51	-0.05	2.26
	10	0.48	99.52	75.68	23.84	6.87	1.48	0.45	2.39
	20	0.24	99.76	74.19	35.57	6.84	1.50	0.54	2.29
	30	0.60	99.40	80.86	18.54	6.57	1.36	0.87	2.93
	50	0.24	99.76	62.79	36.97	7.28	1.55	0.07	2.06
	75	0.90	99.10	75.48	23.61	6.76	1.57	0.53	2.39
	100	0.85	99.15	69.76	29.39	7.01	1.62	0.21	2.13
	200	0.42	99.58	69.53	30.05	7.00	1.63	0.17	2.01
	241	0.54	99.46	68.22	31.23	7.04	1.63	0.18	2.01
CO-3D		0.18	99.82	40.88	58.93	7.78	1.06	-0.62	4.10
CO-6D		0.30	99.70	81.45	18.25	6.98	1.20	0.35	3.18
CO-12D-8		0.18	99.82	64.21	35.61	7.32	1.52	0.15	1.93
IN-1	1	1.21	98.79	54.16	44.63	7.34	1.81	-0.19	1.76
	5	0.72	99.28	59.66	39.61	7.18	1.74	0.02	1.73
	10	0.66	99.34	46.43	52.91	7.80	1.66	-0.43	2.15
	20	0.61	99.39	53.36	46.03	7.57	1.58	-0.30	2.12
	30	0.85	99.15	65.91	33.24	7.05	1.71	0.26	1.92
	50	0.24	99.76	65.99	33.77	7.13	1.63	0.18	1.97
	75	0.91	99.09	69.37	29.72	6.94	1.62	0.20	2.05
	100	0.30	99.70	62.56	37.14	7.34	1.55	-0.04	2.06
	125	0.30	99.70	58.57	41.13	7.40	1.70	-0.07	1.89
	155	0.24	99.76	56.90	42.86	7.56	1.57	-0.20	2.16
IN-2	1	0.24	99.76	70.18	29.37	6.87	1.65	0.32	1.94
	5	1.03	98.97	70.95	28.03	6.80	1.67	0.32	2.00

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ø)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
-1982-									
IN-2	10	0.18	99.82	62.17	37.65	7.24	1.63	0.04	1.86
	20	0.24	99.76	61.82	37.94	7.17	1.73	0.00	1.80
	30	0.60	99.40	59.83	39.57	7.34	1.60	-0.08	1.97
	50	0.24	99.76	60.65	39.11	7.25	1.66	-0.06	1.85
	75	0.48	99.52	56.29	43.22	7.48	1.56	-0.21	2.08
	100	0.24	99.76	57.37	42.39	7.50	1.60	-0.06	1.94
	200	0.24	99.76	54.08	45.67	7.61	1.66	-0.15	1.91
	270	0.61	99.39	55.96	43.43	7.56	1.64	-0.16	2.03
IN-3	1	0.66	99.34	71.16	28.18	6.82	1.67	0.45	2.02
	5	0.30	99.70	68.72	30.98	6.89	1.71	0.32	1.87
	10	0.24	99.76	62.98	36.78	7.16	1.71	0.06	1.81
	20	0.36	99.64	73.80	25.84	6.78	1.63	0.44	2.13
	30	0.79	99.21	66.16	33.05	7.01	1.70	0.21	1.88
	50	0.30	99.70	73.60	26.10	6.83	1.58	0.43	2.20
	100	0.30	99.70	60.49	39.21	7.27	1.71	0.02	1.82
	200	0.66	99.34	71.57	27.77	6.89	1.64	0.43	2.11
	400	0.48	99.52	69.31	30.21	6.96	1.68	0.34	1.98
	550	0.79	99.21	51.65	47.57	7.69	1.65	-0.31	2.14
IN-4	1	0.30	99.70	75.17	24.53	6.67	1.61	0.52	2.16
	5	0.24	99.76	65.47	34.29	7.14	1.66	0.17	1.87
	10	0.54	99.46	55.95	43.50	7.49	1.67	-0.20	2.00
	20	0.24	99.76	61.69	38.06	7.28	1.63	-0.04	1.94
	30	0.48	99.52	62.61	36.91	7.19	1.63	0.05	1.90
	50	0.24	99.76	61.17	38.58	7.31	1.63	-0.08	2.04
	100	0.73	99.27	63.61	35.67	7.10	1.74	0.14	1.86
	200	0.36	99.64	67.91	31.73	7.13	1.63	0.32	2.07
	400	0.36	99.64	71.27	28.36	6.92	1.65	0.26	2.07
	560	0.48	99.52	54.59	44.92	7.70	1.47	-0.30	2.44
IN-5	1	0.48	99.52	64.71	34.81	7.19	1.64	0.14	1.89
	100	0.30	99.70	58.84	40.86	7.41	1.60	-0.08	2.01
IN-6	1	0.24	99.76	59.23	40.53	7.46	1.62	-0.04	1.92
	5	0.18	99.82	54.01	45.81	7.63	1.60	-0.21	2.01
	10	0.48	99.52	55.79	43.73	7.53	1.61	-0.14	1.98
	20	0.24	99.76	61.49	38.26	7.43	1.52	-0.02	2.13
	30	0.42	99.58	63.09	36.48	7.34	1.52	0.06	2.12
	50	0.48	99.52	55.71	43.81	7.53	1.56	-0.25	2.25
	75	0.24	99.76	55.12	44.64	7.60	1.55	-0.14	2.08
	100	0.48	99.52	44.10	55.41	7.95	1.49	-0.53	2.65
	200	0.48	99.52	68.82	30.70	7.10	1.57	0.29	2.11
	260	1.51	98.49	55.65	42.84	7.47	1.69	-0.25	2.12
IN-7	1	0.24	99.76	68.55	31.21	7.10	1.57	0.19	2.01
	5	0.24	99.76	69.62	30.14	7.07	1.58	0.31	2.04

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
IN-7	10	0.24	99.76	71.05	28.71	6.99	1.56	0.36	2.10
	20	0.18	99.82	68.49	31.33	7.23	1.48	0.24	2.18
	30	0.24	99.76	67.57	32.18	7.26	1.52	0.23	2.15
	50	0.24	99.76	64.55	35.21	7.28	1.45	0.13	2.22
	100	0.73	99.27	70.22	29.05	7.04	1.59	0.32	2.21
	200	0.72	99.28	67.07	32.20	7.16	1.57	0.26	2.09
	300	0.85	99.15	66.91	32.24	7.18	1.56	0.13	2.15
	378	0.60	99.40	65.53	33.87	7.27	1.54	0.11	2.11
IN-8	1	0.24	99.76	69.87	29.89	7.27	1.45	0.22	2.38
	5	3.75	96.25	78.05	18.20	6.21	1.71	0.73	2.51
	10	0.24	99.76	71.63	28.13	7.17	1.47	0.29	2.38
	20	0.24	99.76	72.56	27.20	7.14	1.44	0.35	2.40
	30	0.54	99.46	73.38	26.08	7.15	1.39	0.26	2.64
	50	0.24	99.76	64.22	35.54	7.31	1.44	0.13	2.20
	100	0.24	99.76	64.61	35.15	7.28	1.50	0.17	2.14
	200	0.24	99.76	63.11	36.64	7.35	1.56	0.09	2.03
	300	1.33	98.67	62.46	36.21	7.27	1.64	-0.01	2.08
	325	0.18	99.82	61.24	38.58	7.50	1.48	-0.05	2.20
CL-1	1	0.42	99.58	74.76	24.82	7.03	1.43	0.35	2.55
	5	0.48	99.52	65.12	34.39	7.40	1.45	0.12	2.31
	10	0.18	99.82	63.45	36.37	7.51	1.43	0.10	2.31
	20	0.72	99.28	63.56	35.71	7.43	1.49	0.08	2.29
	30	0.18	99.82	65.50	34.32	7.41	1.45	0.19	2.25
	50	0.18	99.82	67.35	32.46	7.34	1.40	0.09	2.45
	75	0.24	99.76	67.61	32.15	7.30	1.41	0.21	2.32
	100	0.30	99.70	58.26	41.44	7.58	1.46	-0.12	2.29
	150	0.24	99.76	61.74	38.02	7.48	1.45	-0.02	2.23
	180	0.18	99.82	56.19	43.63	7.68	1.46	-0.17	2.27
CL-2	1	0.24	99.76	63.91	35.85	7.43	1.48	0.14	2.19
	5	0.24	99.76	64.25	35.51	7.45	1.45	0.12	2.26
	10	0.24	99.76	67.19	32.57	7.37	1.44	0.16	2.37
	20	0.24	99.76	67.81	31.94	7.24	1.54	0.31	2.16
	30	0.24	99.76	69.71	30.05	7.31	1.36	0.31	2.53
	50	0.24	99.76	69.02	30.74	7.29	1.37	0.27	2.52
	75	0.24	99.76	74.50	25.25	6.95	1.42	0.54	2.60
	100	0.24	99.76	69.50	30.26	7.23	1.44	0.33	2.37
	200	0.18	99.82	56.09	43.72	7.61	1.55	-0.04	1.95
	240	0.24	99.76	69.11	30.65	7.23	1.44	0.32	2.29
CL-3	1	0.24	99.76	65.63	34.13	7.35	1.49	0.19	2.15
	5	0.24	99.76	61.67	38.09	7.53	1.53	0.11	2.10
	10	0.48	99.52	62.55	36.97	7.46	1.53	0.04	2.20
	20	0.30	99.70	75.36	24.33	7.04	1.38	0.40	2.61
	30	0.18	99.82	65.29	34.53	7.45	1.41	0.18	2.34

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (φ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ φ	σ φ	Sk	Kurt
CL-3	50	0.24	99.76	66.80	32.95	7.42	1.32	0.27	2.51
	75	0.24	99.76	64.56	35.20	7.41	1.36	0.13	2.47
	100	0.24	99.76	63.02	36.74	7.44	1.39	0.05	2.41
	200	0.24	99.76	62.92	36.83	7.44	1.48	0.09	2.17
	240	0.24	99.76	62.88	36.88	7.40	1.41	0.05	2.29
CL-4	1	0.18	99.82	68.71	31.10	7.16	1.52	0.27	2.13
	5	0.24	99.76	73.70	26.05	7.08	1.42	0.41	2.45
	10	0.24	99.76	65.27	34.49	7.35	1.49	0.15	2.16
	20	0.36	99.64	67.92	31.72	7.32	1.40	0.18	2.46
	30	0.84	99.16	73.83	25.33	7.00	1.42	0.34	2.62
	50	0.24	99.76	71.98	27.78	7.14	1.31	0.21	2.71
	100	0.24	99.76	63.65	36.11	7.43	1.43	0.10	2.31
	200	0.24	99.76	67.88	31.88	7.20	1.48	0.22	2.20
	400	0.24	99.76	63.74	36.02	7.37	1.52	0.13	2.09
	535	0.24	99.76	63.28	36.48	7.39	1.50	0.10	2.07
CL-5	5	0.24	99.76	62.38	37.38	7.53	1.44	0.02	2.30
	10	0.24	99.76	66.28	33.48	7.34	1.49	0.20	2.17
	20	0.24	99.76	66.03	33.72	7.33	1.48	0.09	2.20
	30	0.48	99.52	70.41	29.10	7.24	1.44	0.26	2.44
	50	0.30	99.70	76.09	23.61	7.02	1.36	0.34	2.74
	100	0.24	99.76	71.65	28.11	7.07	1.44	0.31	2.37
	200	0.30	99.70	69.73	29.96	7.08	1.56	0.34	2.15
	400	0.85	99.15	69.38	29.77	7.02	1.59	0.32	2.11
	600	0.24	99.76	65.15	34.61	7.28	1.56	0.22	1.98
	685	0.24	99.76	60.12	39.64	7.48	1.53	-0.10	2.14
CL-6	1	0.24	99.76	73.86	25.90	6.97	1.50	0.39	2.32
	10	0.54	99.46	64.45	35.01	7.32	1.56	0.11	2.12
	20	0.30	99.70	76.13	23.57	6.91	1.47	0.47	2.49
	30	0.24	99.76	61.99	37.77	7.49	1.47	0.05	2.18
	50	0.24	99.76	72.96	26.80	7.20	1.35	0.34	2.62
	100	0.24	99.76	64.88	34.88	7.40	1.37	0.10	2.48
	200	0.30	99.70	66.54	33.16	7.25	1.50	0.16	2.16
	400	0.30	99.70	69.47	30.23	7.18	1.47	0.26	2.25
	600	0.24	99.76	68.02	31.73	7.15	1.57	0.27	2.06
	655	0.30	99.70	61.52	38.17	7.42	1.55	0.07	1.98
CL-7	1	0.24	99.76	64.59	35.17	7.37	1.56	0.16	2.05
	10	0.24	99.76	62.53	37.22	7.44	1.51	0.04	2.13
	20	0.24	99.76	65.27	34.49	7.29	1.59	0.15	2.03
	30	0.54	99.46	60.95	38.50	7.50	1.50	-0.01	2.21
	50	0.54	99.46	76.26	23.20	7.03	1.37	0.42	2.75
	100	0.54	99.45	59.26	40.20	7.55	1.41	-0.10	2.50
	200	0.36	99.64	71.17	28.47	7.03	1.54	0.27	2.22
	400	0.24	99.76	72.47	27.28	7.01	1.54	0.44	2.24

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\bar{X}$ ϕ	σ ϕ	Sk	Kurt
CL-7	600	0.42	99.58	71.19	28.39	6.97	1.61	0.31	2.10
	680	0.24	99.76	58.87	40.89	7.50	1.55	-0.04	2.00
CL-8	1	0.24	99.76	69.69	30.07	7.19	1.49	0.32	2.23
	10	0.24	99.76	69.20	30.56	7.24	1.46	0.27	2.30
	20	0.24	99.76	65.83	33.92	7.47	1.41	0.04	2.47
	30	0.24	99.76	70.27	29.49	7.27	1.43	0.23	2.46
	50	0.24	99.76	69.74	30.02	7.25	1.35	0.29	2.54
	100	0.24	99.76	70.80	28.96	7.09	1.49	0.29	2.30
	200	0.24	99.76	66.88	32.88	7.22	1.55	-0.27	2.08
	400	0.30	99.70	68.25	31.45	7.16	1.56	0.23	2.10
	600	0.24	99.76	71.42	28.33	7.03	1.57	0.42	2.19
	765	0.85	99.15	61.50	37.65	7.30	1.66	0.00	1.94
TI-1	1	0.24	99.76	54.30	45.46	7.68	1.60	-0.22	2.10
	5	0.18	99.82	53.24	46.58	7.72	1.62	-0.13	1.88
TI-3	1	0.18	99.82	66.57	33.25	7.21	1.60	0.21	2.00
	5	0.48	99.52	43.72	55.79	8.00	1.67	-0.48	2.13
	10	0.24	99.76	72.74	27.02	7.03	1.50	0.40	2.26
	20	0.24	99.76	62.19	37.57	7.42	1.51	0.07	1.98
	30	0.60	99.40	55.10	44.29	7.65	1.61	-0.17	2.09
	50	0.30	99.70	70.00	29.69	7.05	1.60	0.33	2.11
	100	0.30	99.70	68.99	30.71	7.07	1.61	0.29	2.02
	200	0.60	99.40	70.10	29.30	7.02	1.59	0.34	2.10
	400	0.24	99.76	67.56	32.20	7.14	1.62	0.27	2.00
	475	0.24	99.76	57.29	42.46	7.54	1.56	-0.14	2.08
TI-6	1	0.48	99.52	64.33	35.19	7.32	1.56	0.05	2.10
	10	0.42	99.58	66.53	33.05	7.17	1.69	0.22	1.95
	20	0.24	99.76	56.21	43.55	7.57	1.59	-0.18	2.06
	30	0.24	99.76	63.08	36.68	7.34	1.55	0.13	1.99
	50	0.24	99.76	69.02	30.74	7.09	1.53	0.34	2.10
	100	0.24	99.76	62.19	37.57	7.29	1.63	0.16	1.88
	200	0.36	99.76	67.99	31.65	7.14	1.59	0.30	2.02
	400	0.24	99.76	68.05	31.71	7.18	1.57	0.33	2.08
	600	0.24	99.76	64.81	34.95	7.28	1.60	0.20	1.98
	770	0.24	99.76	56.54	43.22	7.67	1.46	-0.15	2.27
TI-D-1C		0.12	99.88	22.13	77.75	8.76	1.41	-1.35	4.47
TI-D-1D		0.30	99.70	56.07	43.63	7.50	1.72	-0.06	1.75
TI-D-3		0.30	99.70	59.61	40.09	7.46	1.60	-0.07	2.04

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (Ø)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
1983									
CA-0.2	1	0.48	99.52	76.98	22.54	6.72	1.49	0.68	2.58
	5	0.24	99.76	66.31	33.45	7.19	1.52	0.17	2.10
	10	0.36	99.64	70.02	29.62	6.95	1.54	0.37	2.09
	20	0.24	99.76	71.51	28.25	6.82	1.58	0.46	2.09
	30	0.24	99.76	73.83	25.92	6.77	1.52	0.52	2.22
	50	0.24	99.76	64.40	35.36	7.19	1.56	0.13	2.03
	75	0.24	99.76	66.86	32.90	7.15	1.48	0.22	2.14
	100	0.24	99.76	70.14	29.61	7.06	1.51	0.40	2.14
	119	0.66	99.34	64.21	35.13	7.27	1.57	0.13	2.04
1.0	1	0.24	99.76	68.36	31.40	7.07	1.58	0.28	2.06
	10	0.24	99.76	64.43	35.33	7.19	1.56	0.16	1.97
	35	0.24	99.76	63.45	36.30	7.15	1.59	0.13	1.91
	100	0.12	99.88	69.08	30.80	7.03	1.56	0.31	2.03
	165	0.24	99.76	61.85	37.90	7.45	1.51	0.06	2.09
1.2	1	0.24	99.76	62.09	37.66	7.28	1.61	0.07	1.93
	23	0.24	99.76	65.05	34.71	7.12	1.57	0.21	1.91
	53	0.24	99.76	68.75	31.01	6.92	1.60	0.31	1.98
	103	0.24	99.76	58.02	41.74	7.47	1.55	-0.14	2.10
	193	0.24	99.76	48.49	51.27	7.86	1.64	-0.30	1.99
2.0	1	0.30	99.70	61.67	38.03	7.36	1.62	0.08	1.94
	20	0.24	99.76	66.86	32.90	7.13	1.60	0.24	2.00
	50	1.03	98.97	58.49	40.48	7.31	1.56	-0.11	2.07
	200	0.24	99.76	61.69	38.06	7.47	1.49	0.02	2.15
	315	0.24	99.76	55.38	44.38	7.66	1.50	-0.16	2.14
2.2	1	0.54	99.46	61.13	38.33	7.35	1.65	0.07	1.90
	17	0.24	99.76	67.76	31.99	7.10	1.55	0.29	2.01
	45	0.54	99.46	55.71	43.75	7.31	1.52	-0.22	2.03
	200	0.78	99.22	68.76	30.45	7.06	1.59	0.23	2.12
3.0	1	0.30	99.70	70.01	29.68	7.05	1.58	0.31	2.11
	20	0.18	99.82	56.92	42.90	7.58	1.51	-0.12	2.15
	40	0.18	99.82	58.36	41.46	7.42	1.53	-0.05	2.02
	220	0.24	99.76	63.38	36.38	7.31	1.57	0.06	2.02
	360	0.24	99.76	60.31	39.45	7.43	1.59	-0.02	2.01
4.1	10	0.24	99.76	66.20	33.56	7.22	1.54	0.27	2.03
	30	0.18	99.82	55.22	44.60	7.54	1.59	-0.13	1.97
	45	0.18	99.82	53.81	46.01	7.52	1.50	-0.20	2.13
	100	0.24	99.76	69.35	30.40	7.14	1.48	0.34	2.18
	500	0.24	99.76	64.88	34.88	7.25	1.59	0.13	1.99

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ø)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kurt
- 1983 -									
CA-4.2	1	0.24	99.76	60.77	38.99	7.40	1.61	0.05	1.90
	5	0.54	99.46	56.49	42.97	7.54	1.60	-0.12	2.02
	25	0.48	99.52	63.41	36.11	7.22	1.60	0.09	2.01
	45	0.18	99.82	47.67	52.15	7.69	1.38	-0.42	2.50
	80	0.60	99.40	56.19	43.20	7.42	1.59	-0.12	2.01
	105	0.18	99.82	55.45	44.37	7.52	1.60	-0.08	1.95
5.0	1	0.48	99.52	52.62	46.90	7.80	1.71	-0.19	2.04
	20	0.24	99.76	64.65	35.11	7.36	1.53	0.17	2.11
	70	0.18	99.82	46.77	53.05	7.74	1.33	-0.47	2.73
	500	0.30	99.70	65.95	33.75	7.20	1.60	0.17	2.00
	580	0.24	99.76	57.58	41.18	7.54	1.47	-0.07	2.18
5.1	1	0.24	99.76	62.21	37.55	7.49	1.50	0.05	2.17
	5	0.30	99.70	76.11	23.59	6.76	1.57	0.40	2.27
	30	0.24	99.76	64.21	35.55	7.26	1.55	0.12	2.03
	70	0.18	99.82	45.77	54.04	7.74	1.36	-0.49	2.66
	480	0.30	99.70	65.18	34.52	7.28	1.54	0.11	2.07
6.0	1	0.42	99.58	61.75	37.82	7.51	1.48	0.07	2.19
	20	0.24	99.76	62.33	37.43	7.48	1.48	0.04	2.21
	60	0.18	99.82	53.18	46.64	7.59	1.40	-0.24	2.34
	450	0.24	99.76	62.83	36.93	7.39	1.55	0.13	2.01
	658	0.24	99.76	54.53	45.23	7.66	1.55	-0.15	2.03
6.1	10	0.24	99.76	71.84	27.92	7.07	1.52	0.33	2.23
	20	0.72	99.28	67.47	31.81	7.16	1.54	0.15	2.13
	150	0.24	99.76	67.27	32.49	7.17	1.54	0.23	2.09
	200	0.78	99.22	73.19	26.03	6.92	1.54	0.39	2.28
7.1	1	0.42	99.58	76.13	23.44	6.79	1.50	0.55	2.41
	5	0.24	99.76	82.33	17.43	6.50	1.45	0.87	2.94
	10	0.67	99.33	81.63	17.70	6.56	1.41	0.74	2.89
	20	0.42	99.58	71.67	27.91	6.94	1.59	0.39	2.13
	51	0.48	99.52	76.30	23.22	6.66	1.51	0.60	2.44
	102	0.24	99.76	71.96	27.80	6.89	1.59	0.35	2.09
	303	0.78	99.22	80.27	18.94	6.50	1.51	0.73	2.66
9.0	5	0.67	99.33	66.40	32.94	7.29	1.47	0.06	2.31
	40	0.18	99.82	53.53	46.28	7.66	1.42	-0.19	2.31
	50	0.42	99.58	57.30	42.28	7.50	1.45	-0.23	2.39
	400	0.42	99.58	76.66	22.92	6.85	1.45	0.44	2.43
	645	0.24	99.76	66.24	33.52	7.17	1.62	0.18	1.97

TER SAMPLES			SIZE FRACTIONS (%)			MOMENT STATISTICS (φ)			
ample ID		Sand	Mud	Silt	Clay	$\overline{X}$ φ	σ φ	Sk	Kurt
0.1A	5	0.24	99.76	58.82	40.94	7.57	1.52	-0.05	2.11
	10	0.24	99.76	59.65	40.11	7.45	1.58	-0.03	2.00
	20	0.30	99.70	61.83	37.87	7.38	1.59	0.00	2.03
	30	0.24	99.76	63.23	36.53	7.36	1.56	0.12	2.01
	45	0.24	99.76	64.87	34.89	7.37	1.51	0.08	2.17
0.2	1	0.36	99.64	68.60	31.04	7.06	1.57	0.27	2.01
	20	0.30	99.70	67.83	31.86	7.19	1.57	0.22	2.09
	40	0.24	99.76	63.69	36.07	7.27	1.63	0.06	1.97
	75	0.24	99.76	66.71	33.05	7.15	1.60	0.19	1.99
0.3	5	0.24	99.76	62.28	37.48	7.36	1.57	-0.04	2.04
	10	0.24	99.76	64.33	35.43	7.32	1.54	0.08	2.06
	20	0.24	99.76	69.44	30.32	6.99	1.65	0.32	1.98
	30	0.54	99.46	58.37	41.09	7.41	1.69	-0.13	1.91
	135	0.24	99.76	56.07	43.68	7.66	1.52	-0.14	2.14
1.1	5	0.30	99.70	68.73	30.97	7.11	1.60	0.29	2.08
	30	0.24	99.76	59.63	40.13	7.47	1.57	-0.02	2.00
	40	0.24	99.76	56.45	43.30	7.64	1.51	-0.15	2.22
	130	0.24	99.76	78.86	20.90	6.71	1.48	0.70	2.69
	250	0.24	99.76	79.84	19.92	6.67	1.44	0.80	2.80
1.2A	1	0.24	99.76	70.19	29.57	7.05	1.56	0.30	2.10
	20	0.30	99.70	68.03	31.67	7.11	1.57	0.20	2.03
	30	0.30	99.70	68.71	30.99	7.10	1.60	0.23	2.05
	200	1.57	98.43	69.74	28.69	6.95	1.63	0.21	2.14
	290	0.78	99.22	63.88	35.33	7.31	1.57	0.05	2.14
1.2B	1	1.75	98.25	70.66	27.59	6.83	1.66	0.25	2.06
	10	0.30	99.70	67.18	32.52	7.21	1.51	0.12	2.11
	20	1.03	98.97	70.11	28.86	7.01	1.58	0.15	2.16
	200	0.72	99.28	65.29	33.99	7.17	1.65	0.08	2.00
	275	0.78	99.22	62.96	36.25	7.35	1.57	0.01	2.12
2.1	1	1.03	98.97	70.53	28.44	6.81	1.71	0.28	1.98
	30	0.24	99.76	66.84	32.94	7.26	1.50	0.11	2.13
	50	0.24	99.76	66.06	33.70	7.24	1.56	0.19	2.03
	100	0.30	99.70	68.38	31.38	7.13	1.58	0.19	2.12
	330	0.24	99.76	66.24	35.51	7.34	1.54	0.11	2.07
2.2	1	0.12	99.88	63.81	36.07	7.37	1.56	0.11	2.02
	10	0.30	99.70	69.07	30.63	7.09	1.56	0.22	2.06
	20	0.30	99.70	61.15	38.55	7.41	1.60	0.07	1.94
	100	1.33	98.67	73.04	25.63	6.77	1.68	0.40	2.17
	387	0.24	99.76	65.84	33.92	7.18	1.63	0.17	1.98

WATER SAMPLES		SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Sand	Mud	Silt	Clay	$\overline{X}$ ϕ	σ ϕ	Sk	Kur
IT 2.3	1	0.24	99.76	62.33	37.43	7.48	1.54	0.06	2.14
	10	1.27	98.73	72.48	26.25	6.87	1.61	0.36	2.25
	20	0.30	99.70	64.87	34.82	7.18	1.69	0.29	1.88
	100	0.85	99.15	73.54	25.61	6.98	1.49	0.40	2.43
	395	0.18	99.82	55.38	44.44	7.72	1.45	-0.18	2.25
IT 3.1	5	0.30	99.70	67.55	32.14	7.16	1.59	0.16	2.05
	20	0.36	99.64	71.46	28.18	7.00	1.53	0.26	2.21
	30	0.24	99.76	68.13	31.63	7.08	1.63	0.28	1.97
	270	0.24	99.76	69.44	30.32	7.13	1.53	0.23	2.16
	345	0.24	99.76	62.06	37.70	7.51	1.44	0.01	2.24
IT 6.0	5	0.24	99.76	69.35	30.41	7.06	1.55	0.30	2.09
	30	0.18	99.82	54.40	45.42	7.51	1.49	-0.17	2.07
	40	0.24	99.76	52.74	47.02	7.44	1.43	-0.25	2.17
	50	0.48	99.52	62.50	37.02	7.13	1.48	0.06	2.03
	535	0.48	99.52	72.86	26.65	6.95	1.52	0.35	2.21
MC 0.1A	5	0.24	99.76	61.75	38.01	7.46	1.50	0.30	2.10
	20	0.60	99.40	60.61	38.79	7.39	1.60	0.02	1.98
	30	0.30	99.70	69.22	30.47	7.10	1.54	0.31	2.10
	50	0.24	99.76	68.69	31.07	7.23	1.47	0.23	2.26
	92	0.24	99.76	62.96	36.79	7.42	1.51	0.10	2.09
MC 0.1C	1	0.30	99.70	61.62	38.08	7.41	1.53	0.00	2.09
	10	0.24	99.76	58.67	41.08	7.56	1.49	-0.06	2.14
	50	0.24	99.76	65.85	33.91	7.31	1.52	0.11	2.14
	135	0.24	99.76	61.15	38.61	7.31	1.64	-0.02	1.92
	175	0.06	99.94	59.54	40.40	7.50	1.53	-0.02	2.00
MC 2.0B	5	0.30	99.70	69.04	30.65	7.04	1.57	0.35	2.02
	50	0.30	99.70	72.16	27.54	6.97	1.54	0.47	2.21
	165	0.24	99.76	60.35	39.41	7.46	1.54	-0.01	2.04
	250	0.36	99.64	65.02	34.61	7.28	1.55	0.11	2.07
	310	0.24	99.76	59.43	40.33	7.51	1.54	0.00	2.01
MC 2.1B	5	0.30	99.70	67.58	32.12	7.11	1.62	0.27	1.98
	30	0.91	99.09	81.85	17.24	6.58	1.38	0.69	2.95
	50	0.61	99.39	70.57	28.83	7.03	1.56	0.25	2.16
	175	0.24	99.76	59.25	40.51	7.45	1.60	-0.03	1.95
	308	0.24	99.76	58.19	41.57	7.53	1.58	-0.03	1.95
MC 3.05	1	0.36	99.64	72.94	26.69	6.90	1.58	0.34	2.18
	30	0.30	99.70	62.61	37.09	7.35	1.58	0.08	2.00
	100	0.30	99.70	60.73	38.97	7.37	1.63	0.01	1.92
	525	0.24	99.76	49.14	50.62	7.88	1.47	-0.32	2.30
MC 4.1C	1	0.36	99.64	70.40	29.23	6.98	1.59	0.33	2.10
	30	0.18	99.82	50.17	49.65	7.70	1.49	-0.30	2.23
	40	0.18	99.82	44.55	55.27	7.79	1.45	-0.46	2.42
	300	0.30	99.70	66.24	33.46	7.18	1.62	0.23	1.92
	530	1.02	98.98	68.32	30.66	7.01	1.66	0.11	2.02

Water samples

Pages	4-27 to 4-53	1983	Itirbilung Fjord
Pages	4-54 to 4-92	1983	Cambridge Fjord
Pages	4-93 to 4-107	1983	McBeth Fjord
Pages	4-108 to 4-128	1982	Itirbilung Fjord

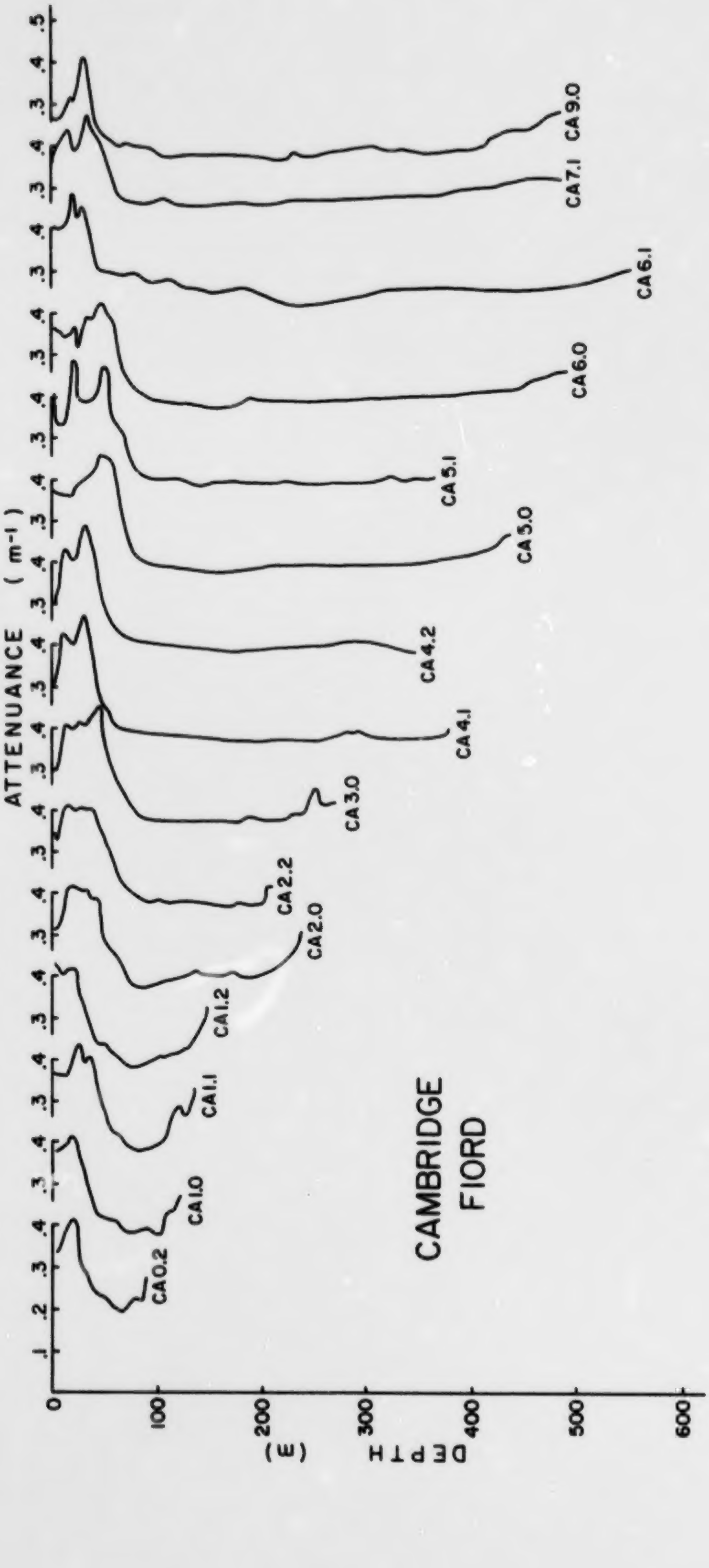

ATTENUANCE (m^{-1})
.1
.2
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.3
.4
.5
CA0.2
CA1.0
CA1.1
CA1.2
CA2.0
CA2.2
CA3.0
CA4.1
CA4.2
CA5.0
CA5.1
CA6.0
CA6.1
CA7.1
CA9.0
CAMBRIDGE
FIORD
DEPTH
(m)
0
100
200
300
400
500
600

Fig. 4-1

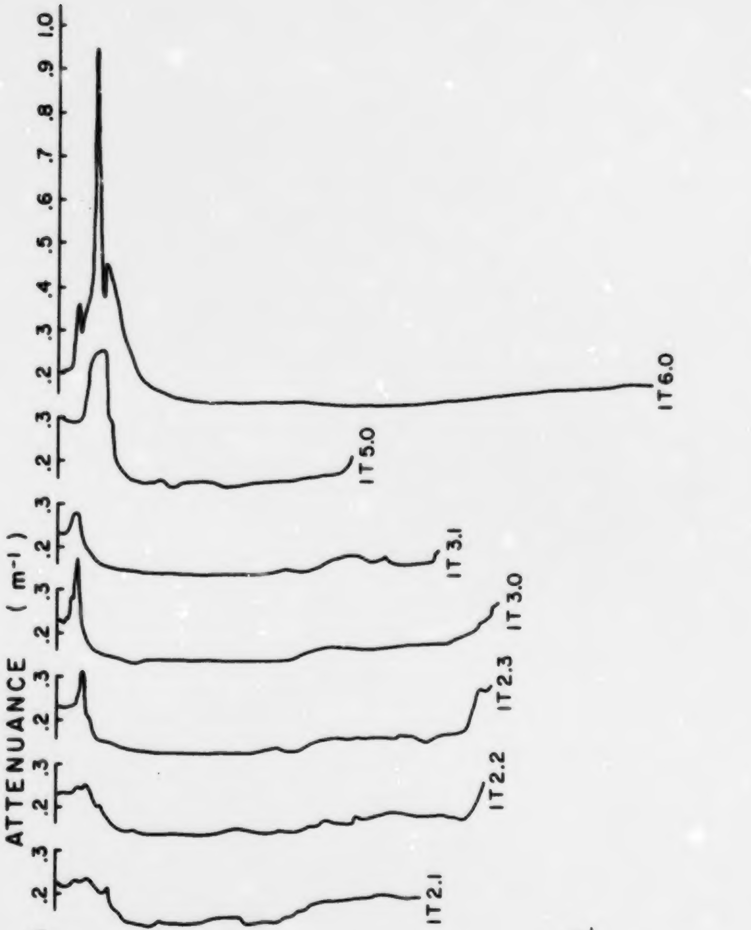

ATTENUANCE (m⁻¹)
DEPTH (m)
0
100
200
300
400
500
600
.2
.3
.4
.5
.6
.7
.8
.9
1.0
ITIRBILUNG FIORD
IT0.2
IT0.3
IT0.4
IT1.1
IT1.2
IT2.1
IT2.2
IT2.3
IT3.0
IT3.1
IT5.0
IT6.0
IT0.1
0
50
100
.2
.4
.6
.8
1.0

Fig. 4-2

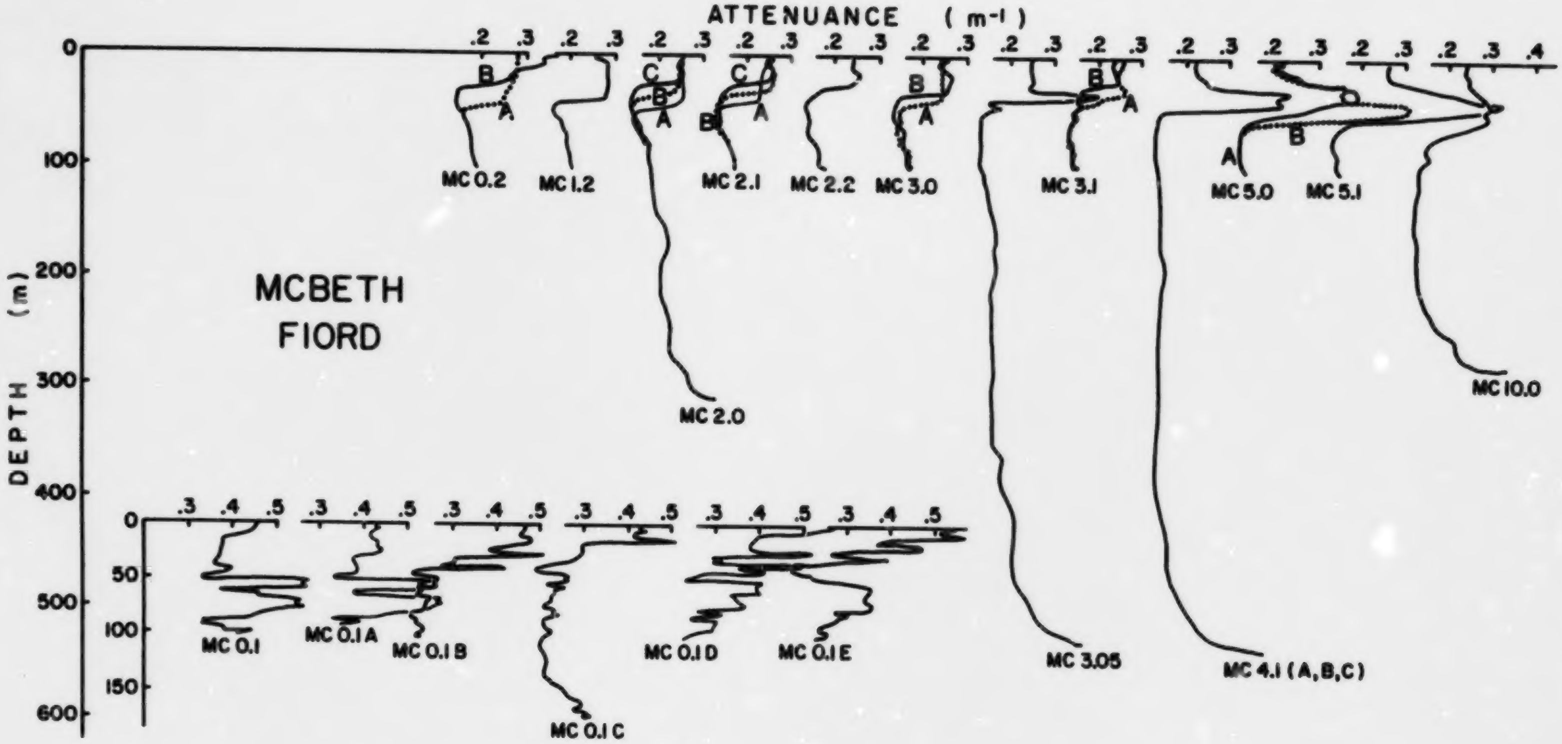
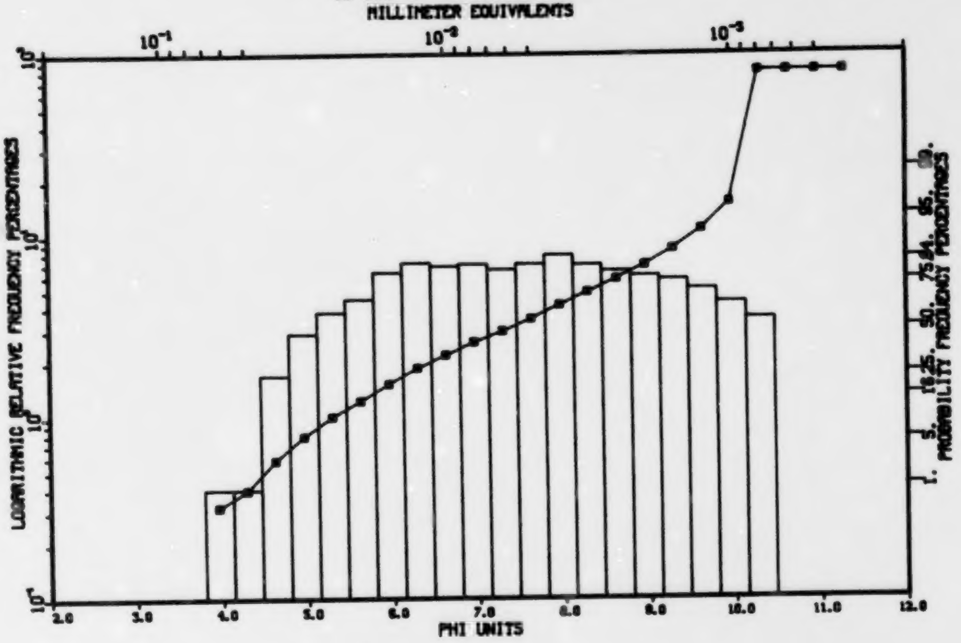
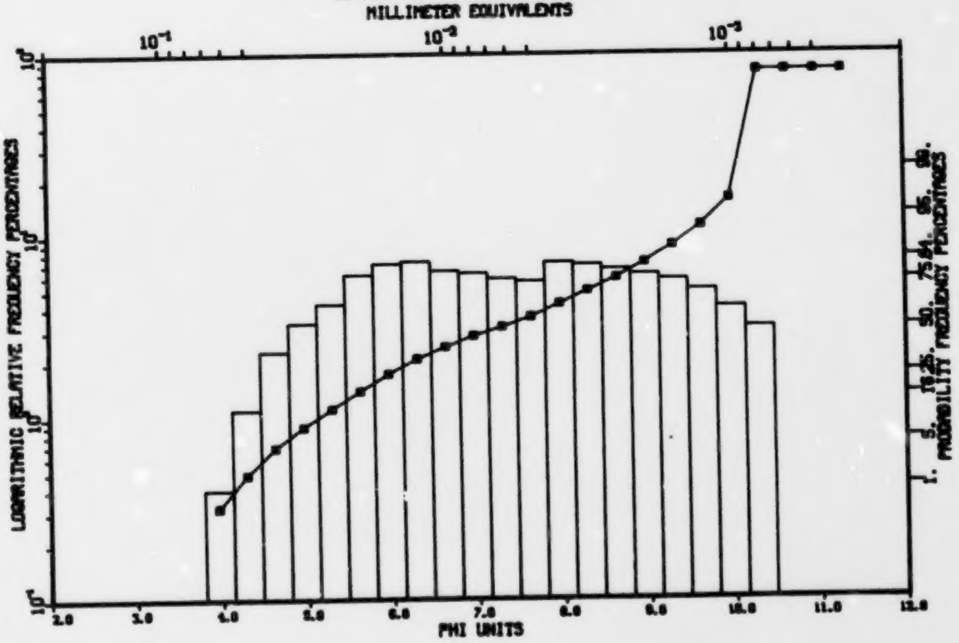

ATTENUANCE (m-1)
DEPTH (m)
0
100
200
300
400
500
600
.2
.3
.4
.5
0
50
100
150
A
B
C
MCBETH
FIORD
MC 0.2
MC 1.2
MC 2.0
MC 2.1
MC 2.2
MC 3.0
MC 3.05
MC 3.1
MC 4.1 (A,B,C)
MC 5.0
MC 5.1
MC 10.0
MC 0.1
MC 0.1A
MC 0.1B
MC 0.1C
MC 0.1D
MC 0.1E

Fig. 4-3

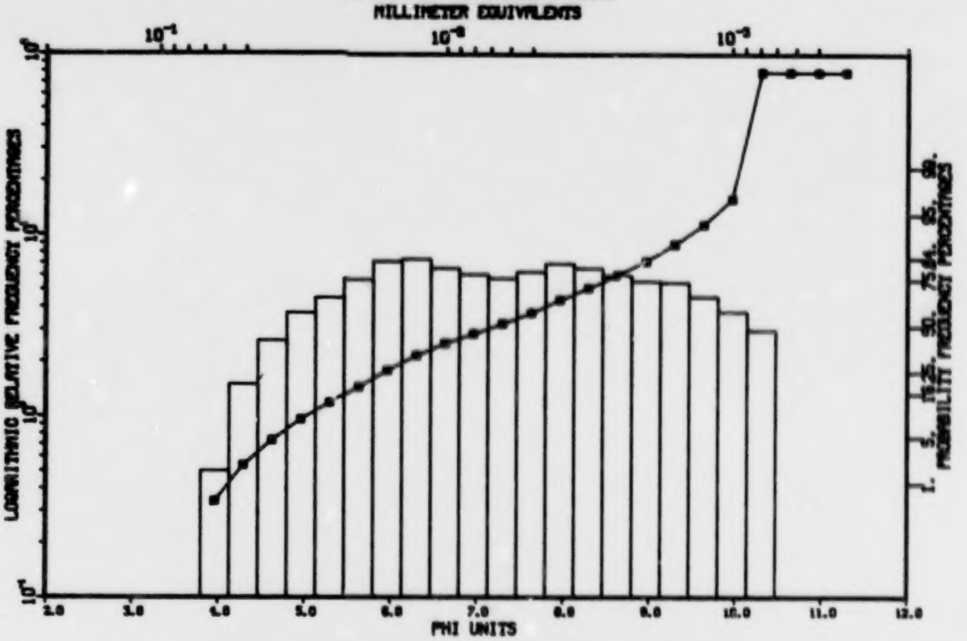
SAMPLE NO. - 984 J. SYVITSKI 8317677
IT-0.1A 5 ITIRBILUNG FJORD



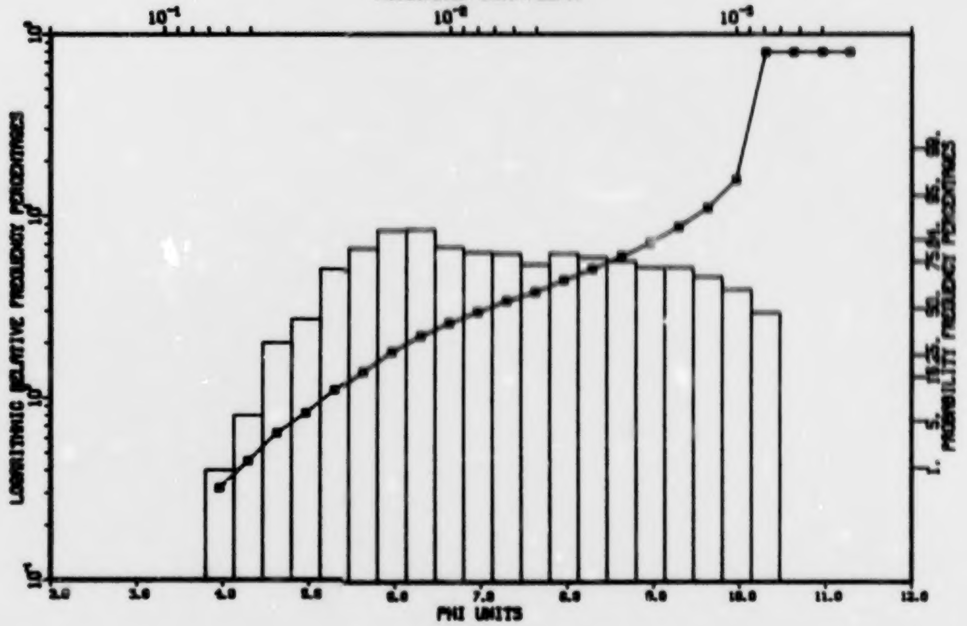
SAMPLE NO. - 985 J. SYVITSKI 8317676
IT-0.1A 10 ITIRBILUNG FJORD



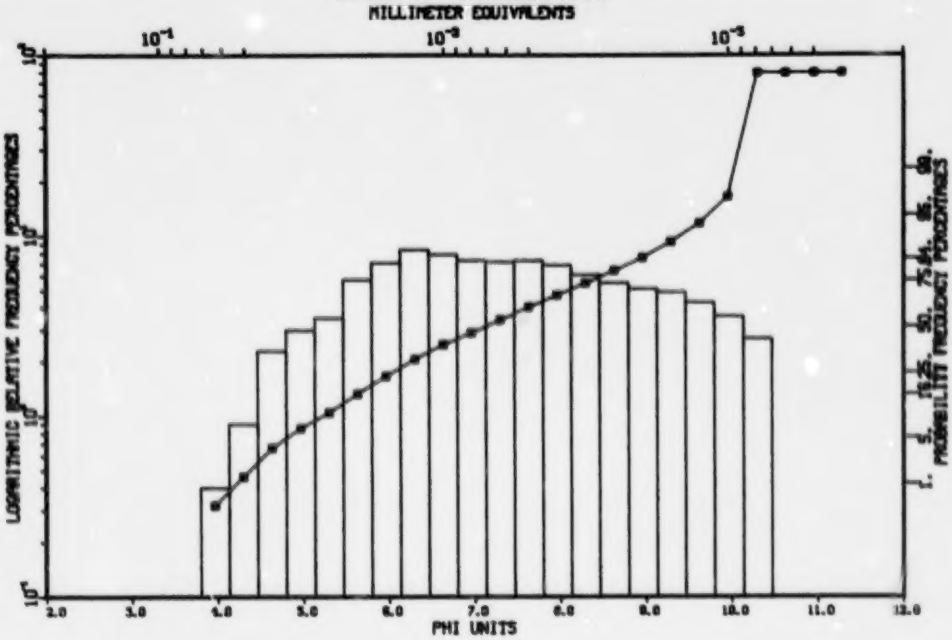
SAMPLE NO. - 986 J. SYVITSKI 8317875
IT-0.1A 30 ITIRBILUNG FJORD



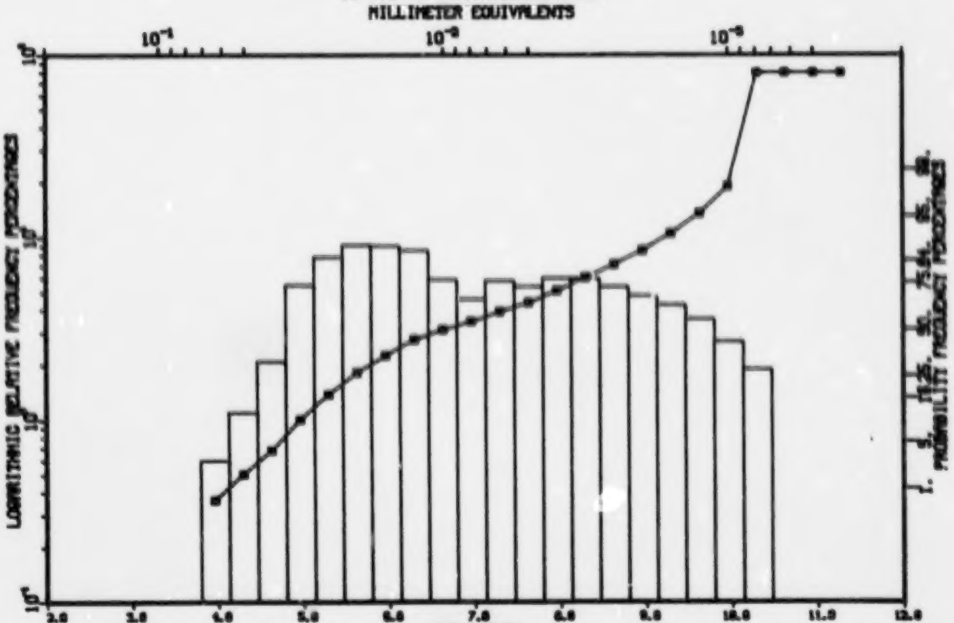
SAMPLE NO. - 987 J. SYVITSKI 8317874
IT-0.1A 30 ITIRBILUNG FJORD



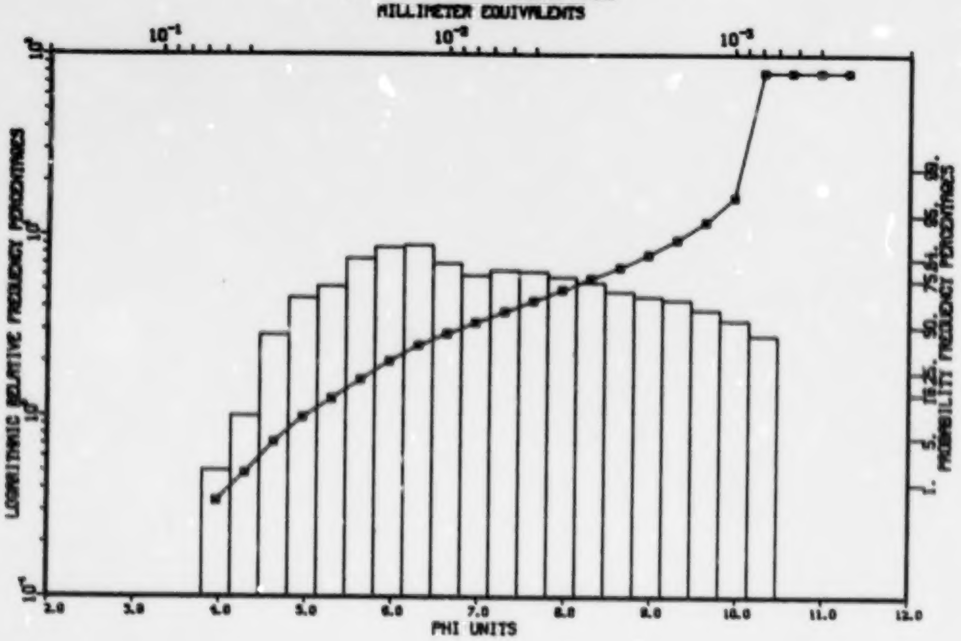
SAMPLE NO. - 988 J. SYVITSKI 8317672
IT-0.1A 45 ITIRBILUNG FJORD



SAMPLE NO. - 988 J. SYVITSKI 8317661
IT-0.2 1 ITIRBILUNG FJORD



SAMPLE NO. - 980 J. SYVITSKI 8317658
IT-0.2 20 ITIRBILUNG FJORD



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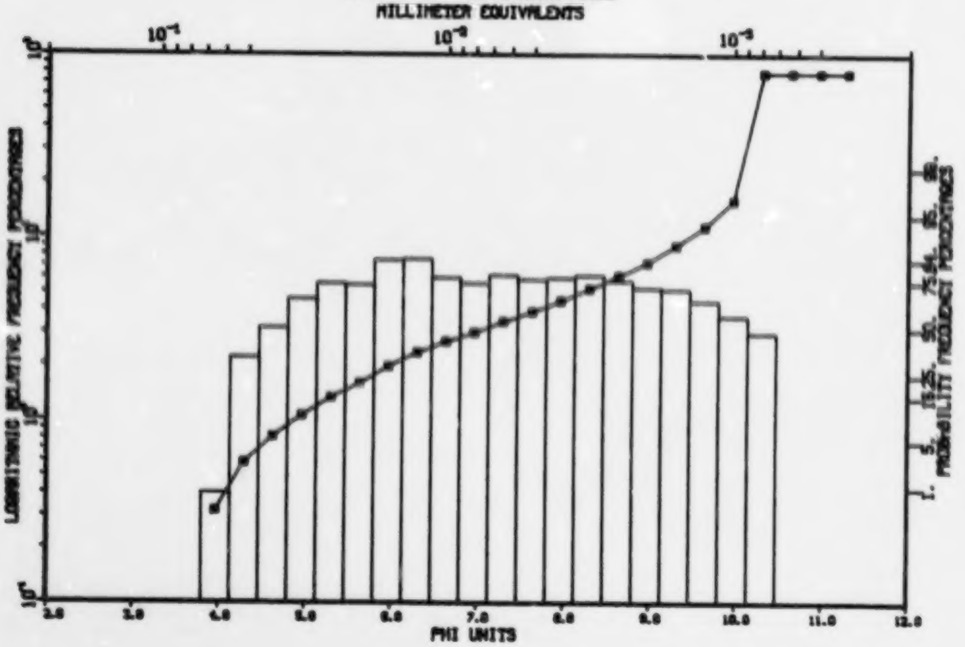
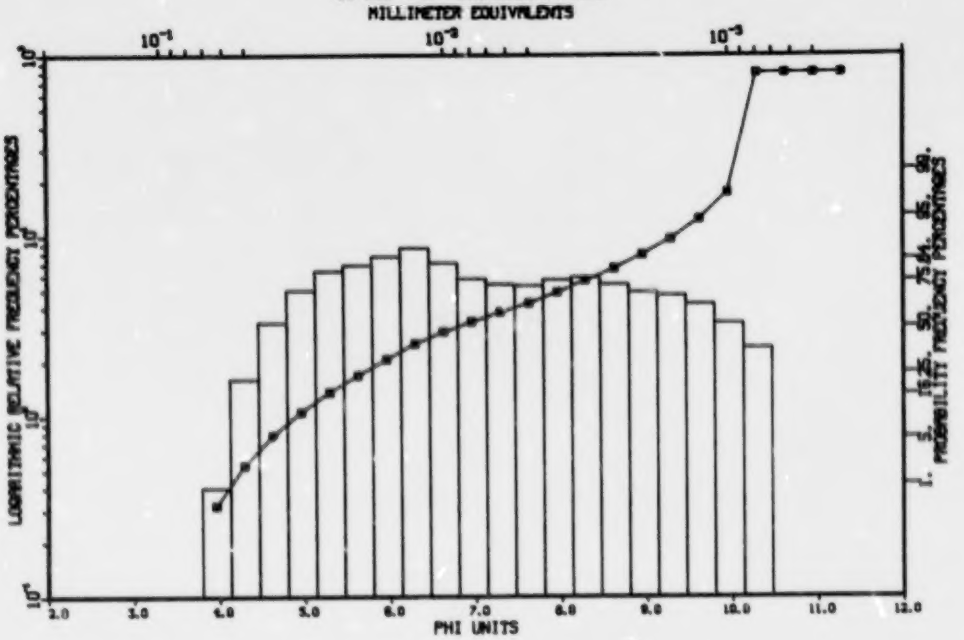
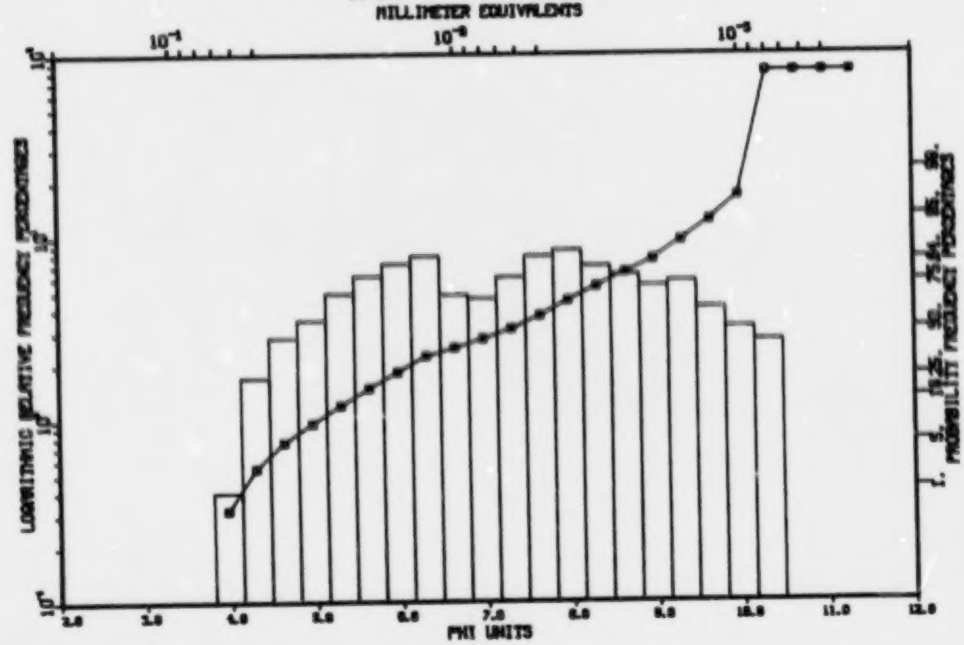
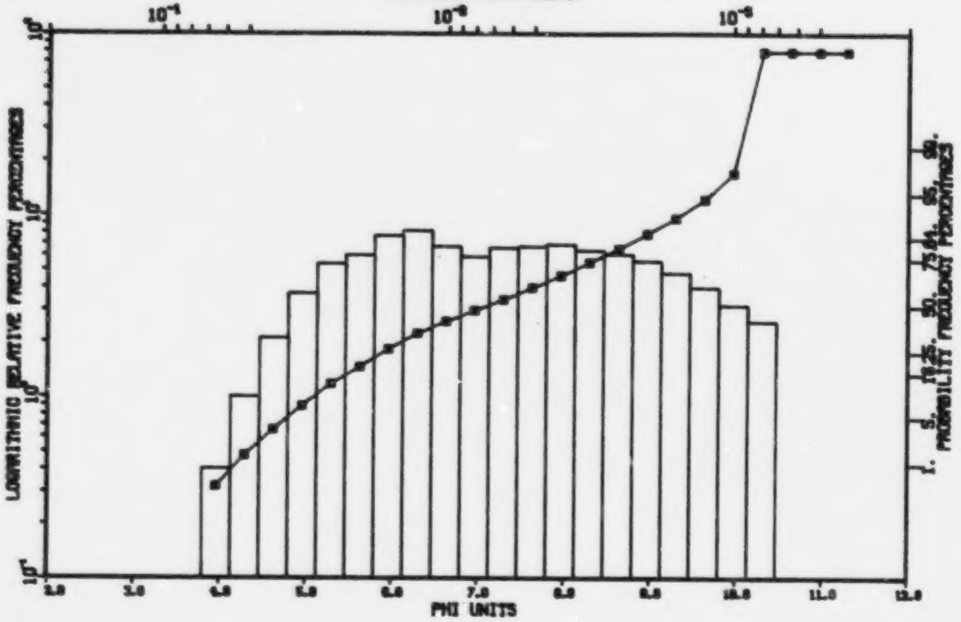


SAMPLE NO. - 882 J. SYVITSKI 8317654
IT-0.2 75 ITIRBILUNG FJORD

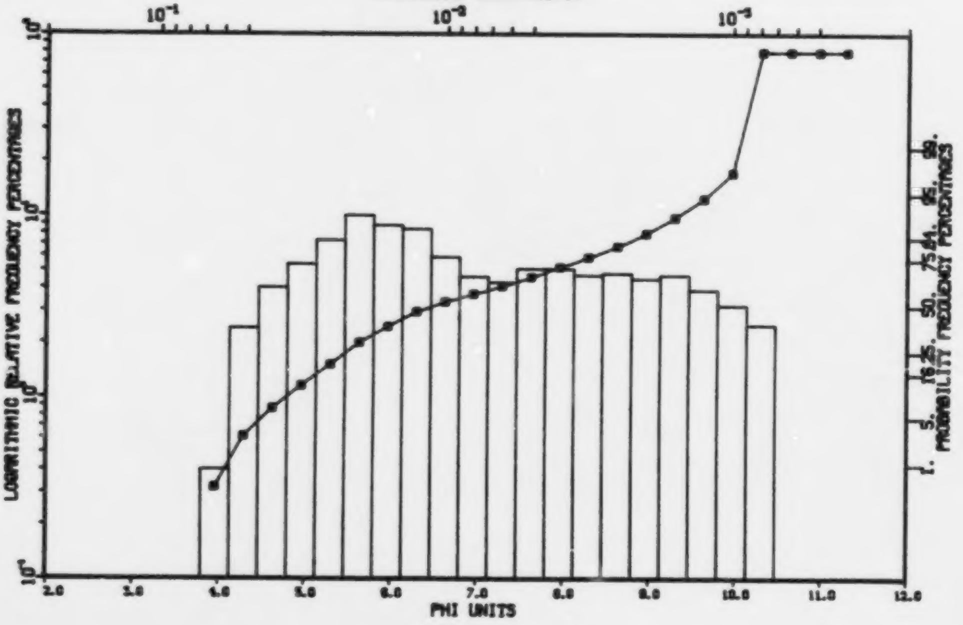


SAMPLE NO. - 883 J. SYVITSKI 8317670
IT-0.3 5 ITIRBILUNG FJORD



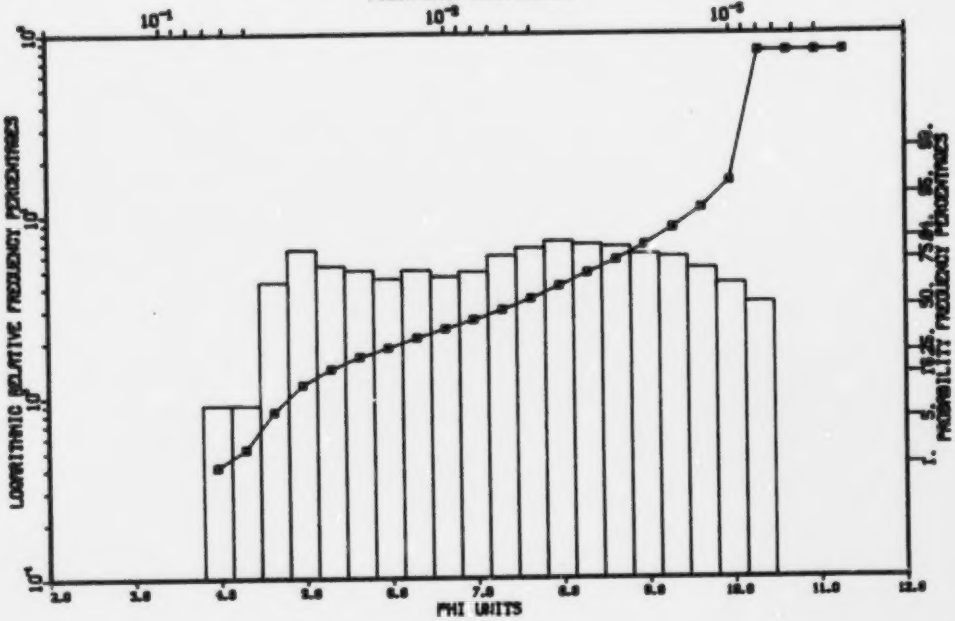


SAMPLE NO. - 004 J. SYVITSKI 8317088
IT-0.3 10 ITIRBILUNG FJORD

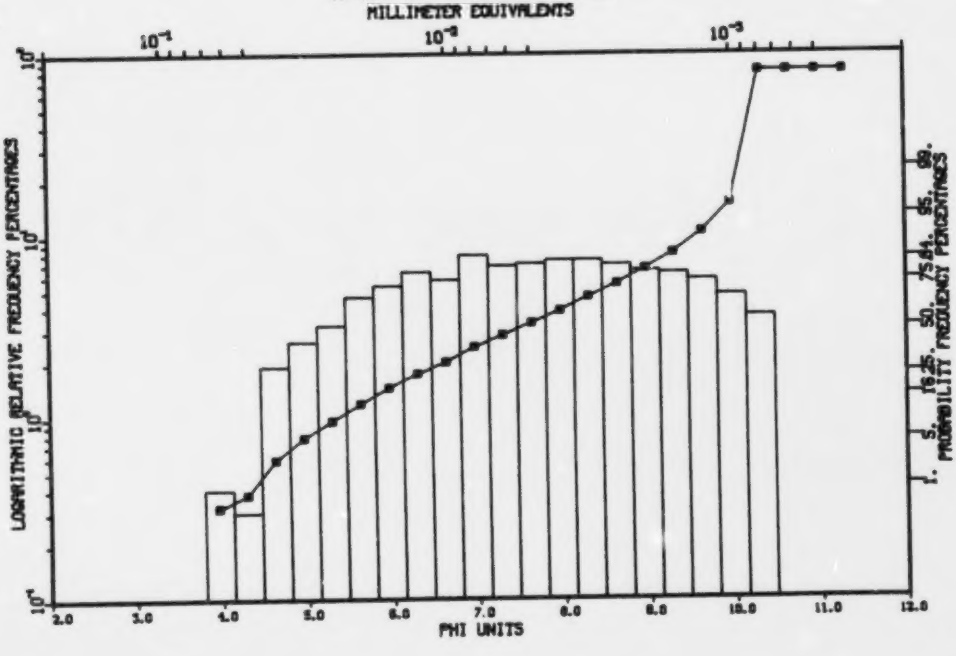


SAMPLE NO. - 005 J. SYVITSKI 8317088
IT-0.3 20 ITIRBILUNG FJORD

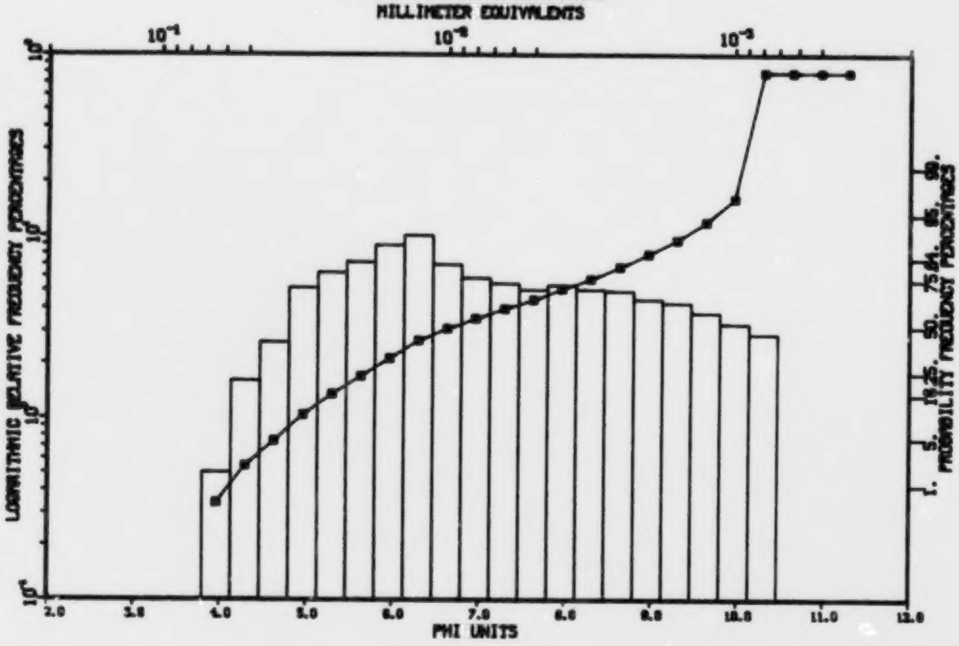
SAMPLE NO. - 986 J. SYVITSKI 8317887
IT-0.3 30 ITIRBILUNG FJORD



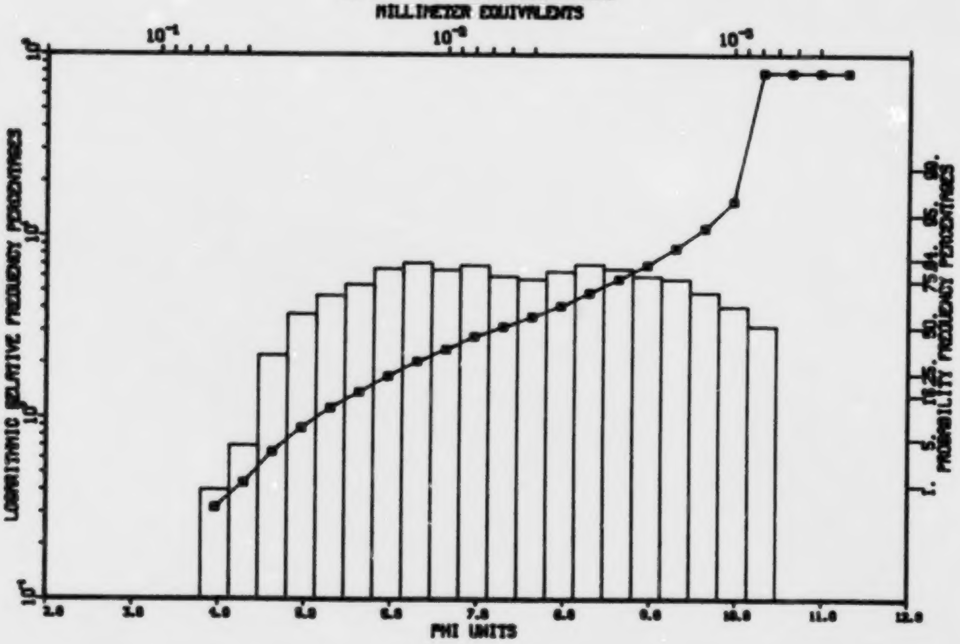
SAMPLE NO. - 987 J. SYVITSKI 8317663
IT-0.3 135 ITIRBILUNG FJORD



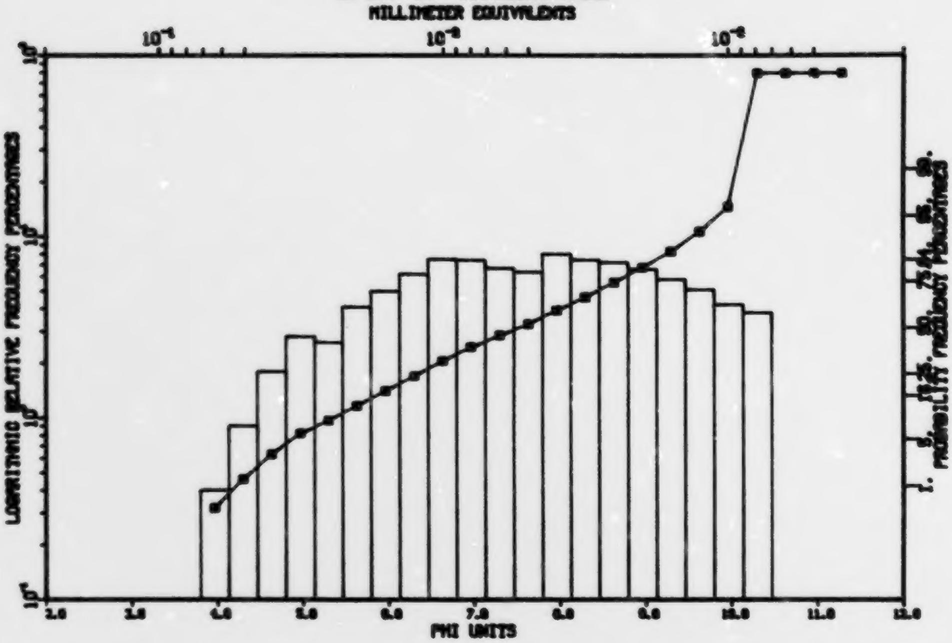
SAMPLE NO. - 980 J. SYVITSKI 8317852
IT-1.1 5 ITIRBILUNG FJORD



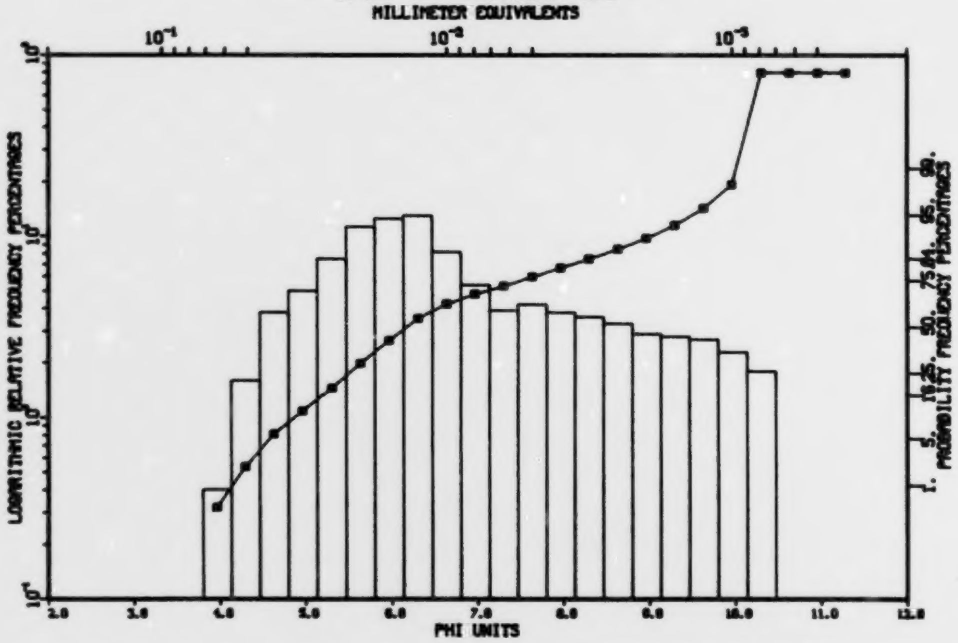
SAMPLE NO. - 980 J. SYVITSKI 8317849
IT-1.1 30 ITIRBILUNG FJORD



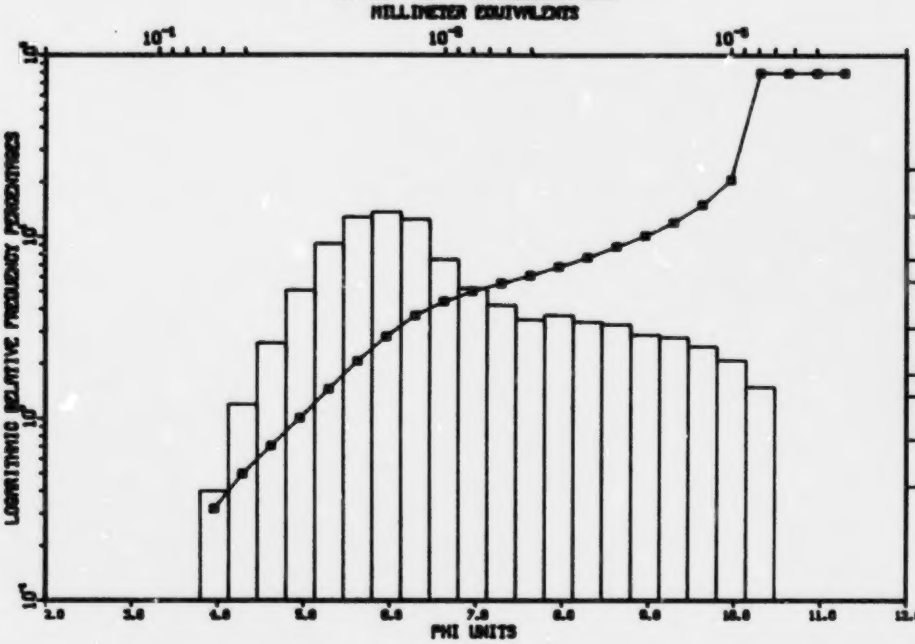
SAMPLE NO. - 1000 J. SYVITSKI 8317046
IT-1.1 40 ITIRBILUNG FJORD



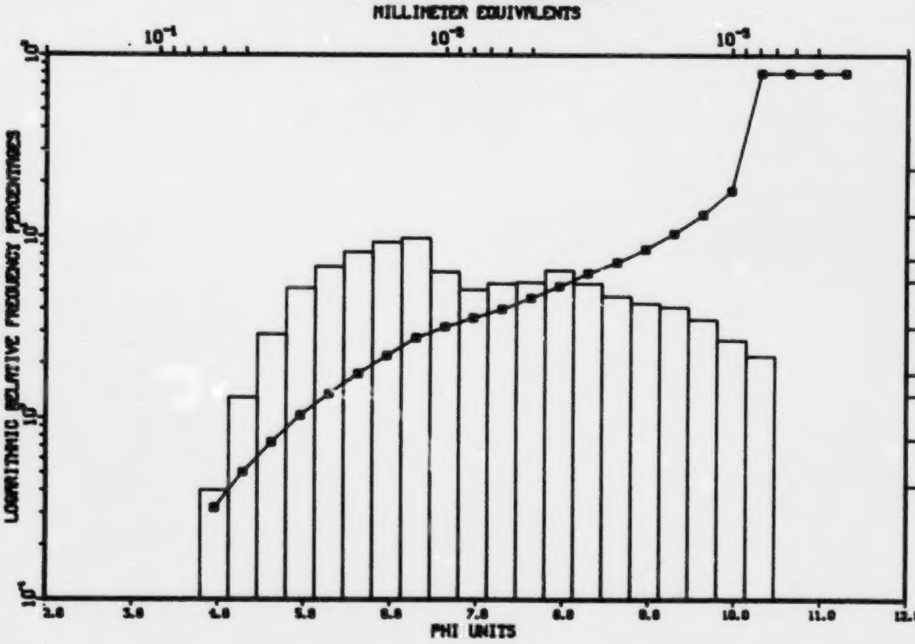
SAMPLE NO. - 1001 J. SYVITSKI 8317046
IT-1.1 130 ITIRBILUNG FJORD



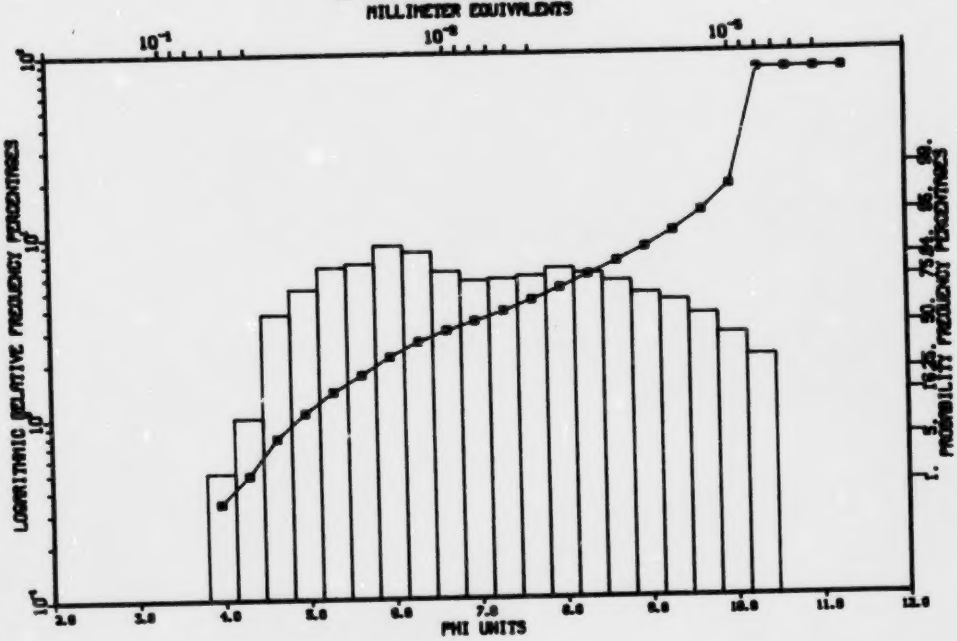
SAMPLE NO. - 1002 J. SYVITSKI 8317845
IT-1.1 280 ITIRBILUNG FJORD



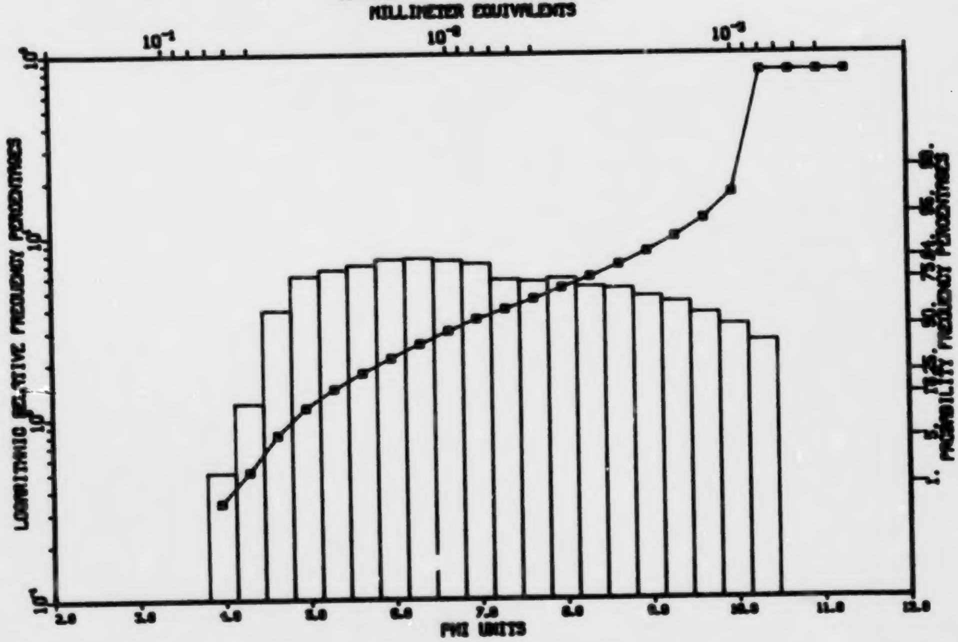
SAMPLE NO. - 1003 J. SYVITSKI 8317844
IT-1.2A 1 ITIRBILUNG FJORD



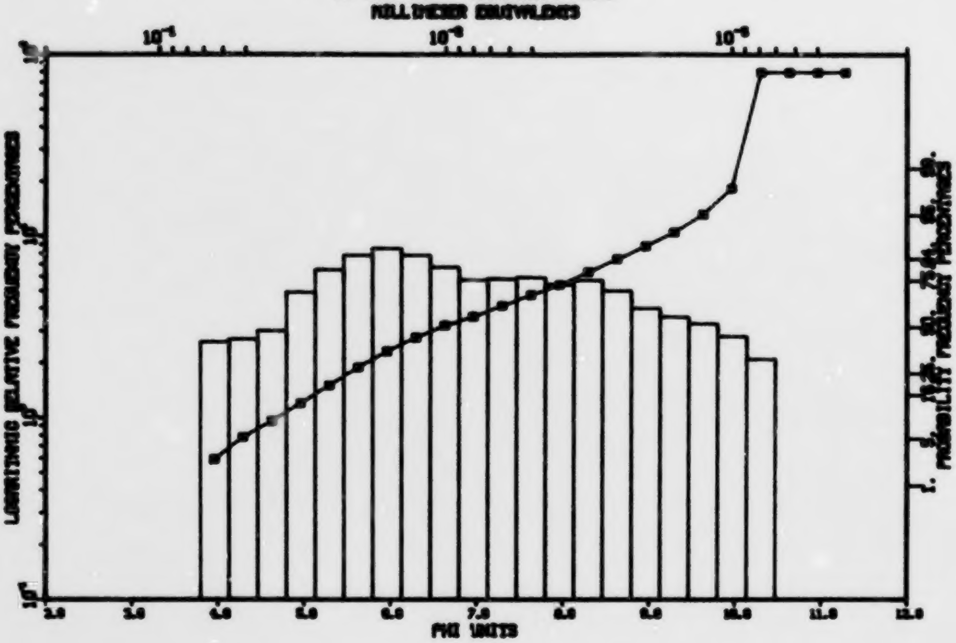
SAMPLE NO. - 1004 J. SYVITSKI 8317842
IT-1.2A 2D ITIRBILUNG FJORD



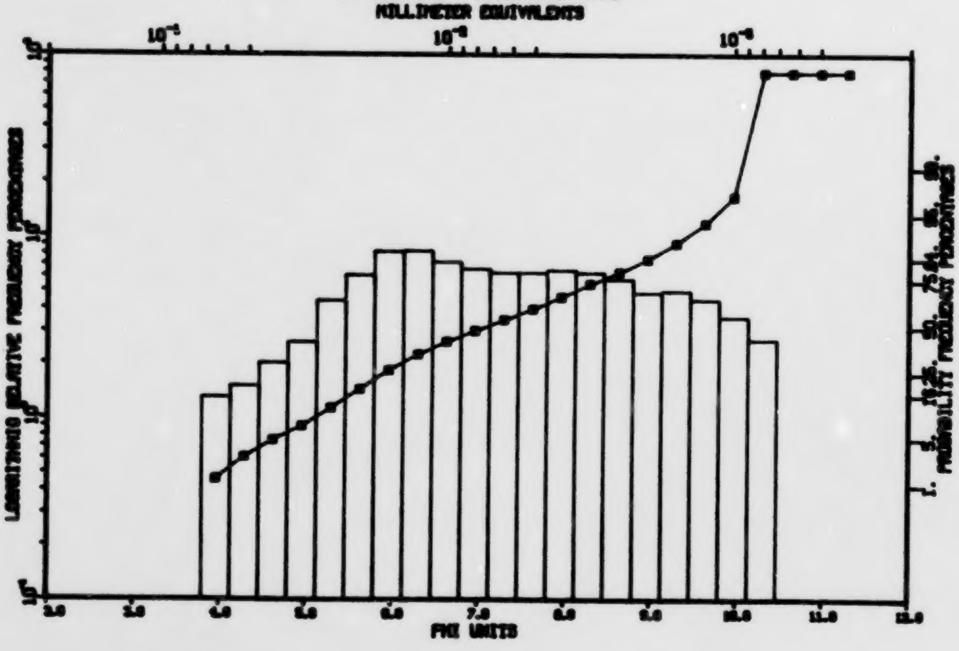
SAMPLE NO. - 1005 J. SYVITSKI 8317841
IT-1.2A 3D ITIRBILUNG FJORD



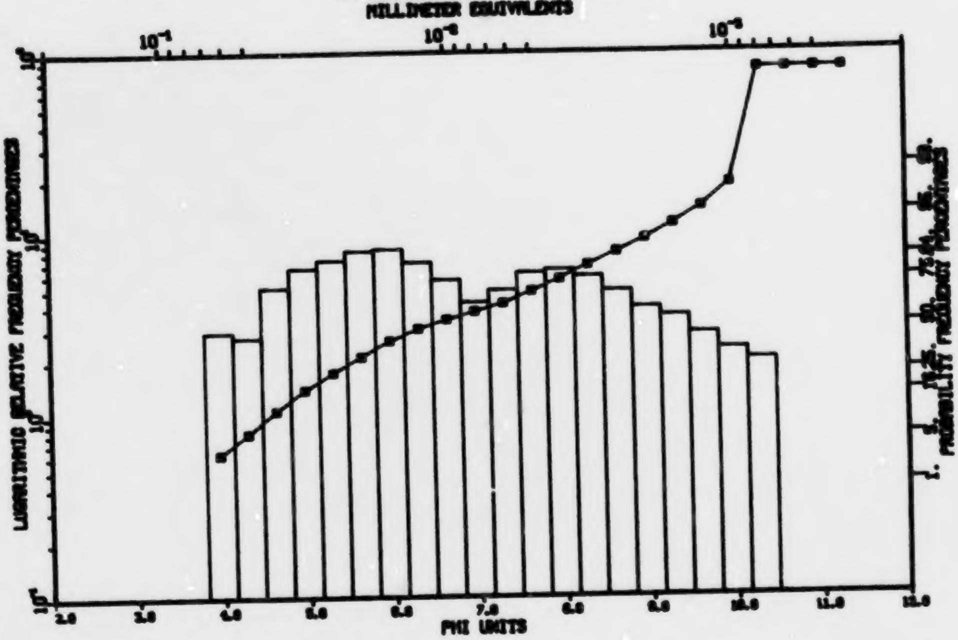
SAMPLE NO. - 1806 J. SYVITSKI 8317657
IT-1.2A 200 ITIRBILUNG FJORD



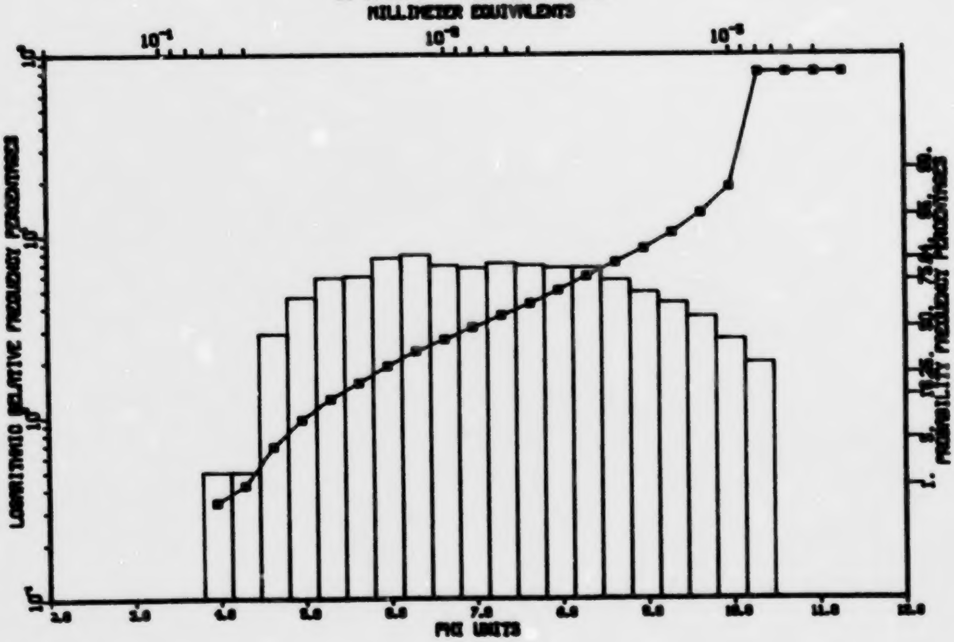
SAMPLE NO. - 1807 J. SYVITSKI 8317658
IT-1.2A 200 ITIRBILUNG FJORD



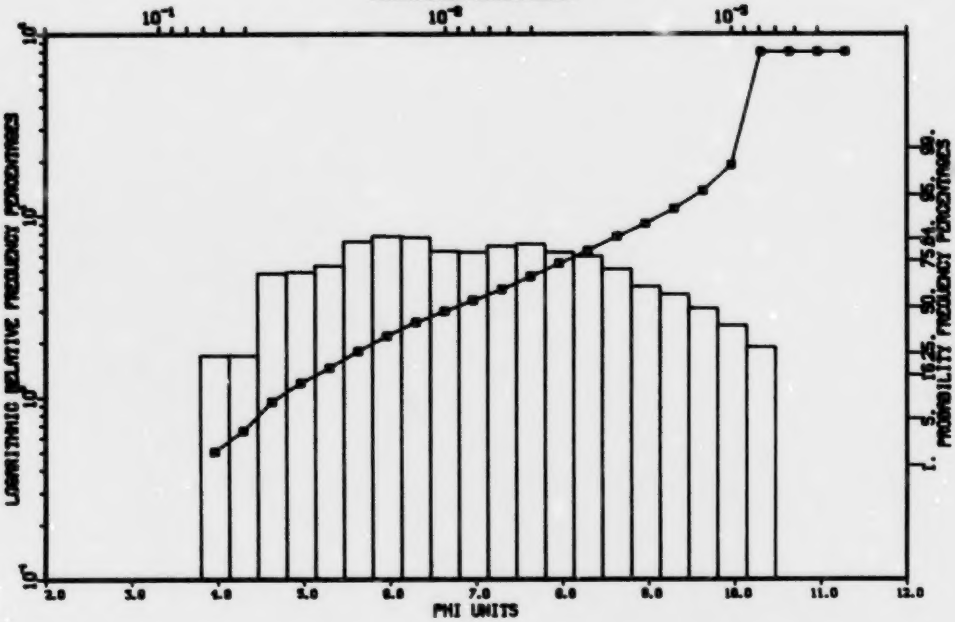
SAMPLE NO. - 1000 J. SYVITSKI 8317088
IT-1.2B 1 ITIRBILUNG FJORD



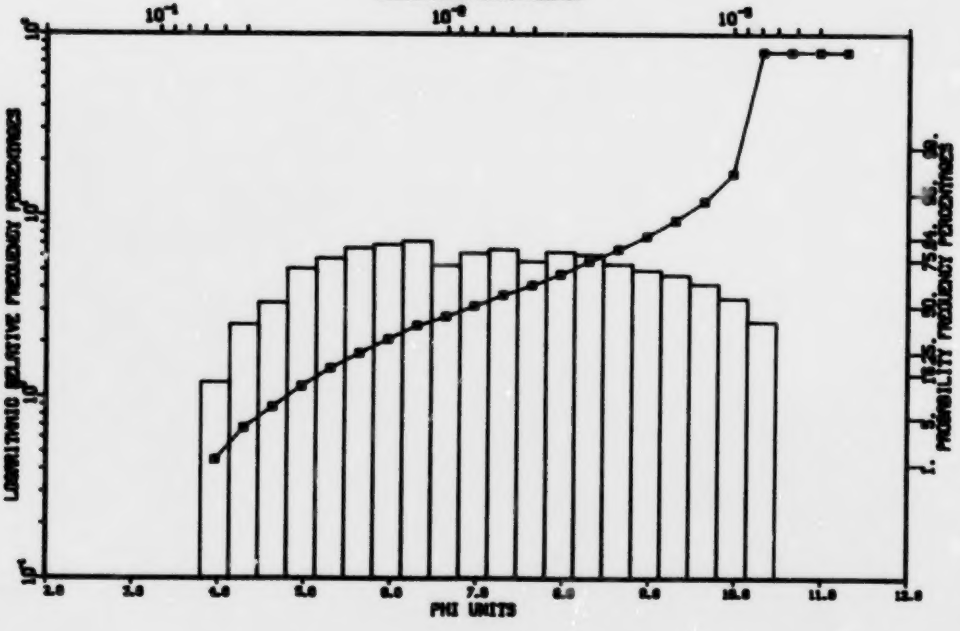
SAMPLE NO. - 1000 J. SYVITSKI 8317087
IT-1.2B 10 ITIRBILUNG FJORD



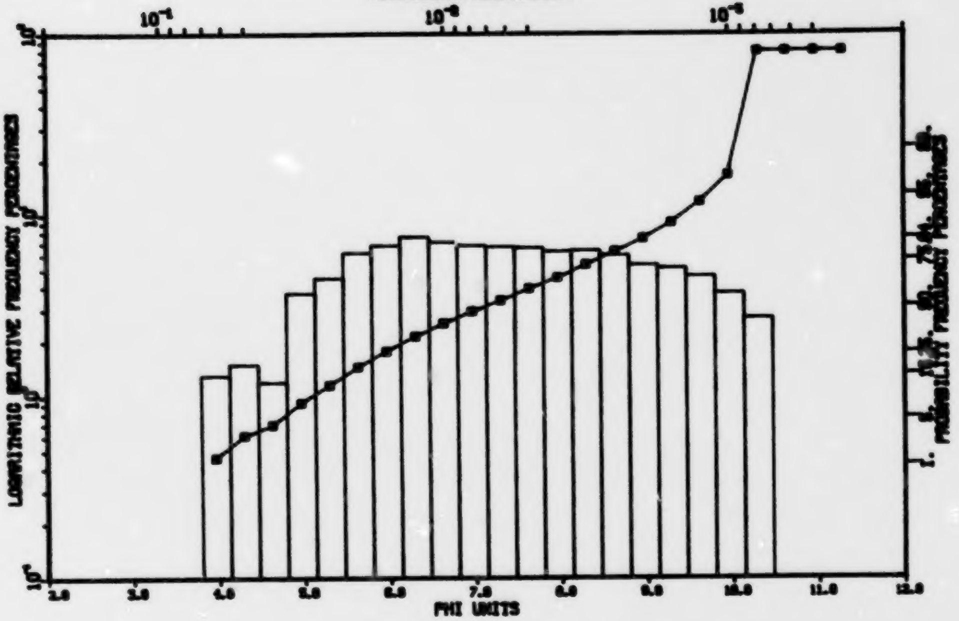
SAMPLE NO. - 1010 J. SYVITSKI 8317088
IT-1.28 20 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



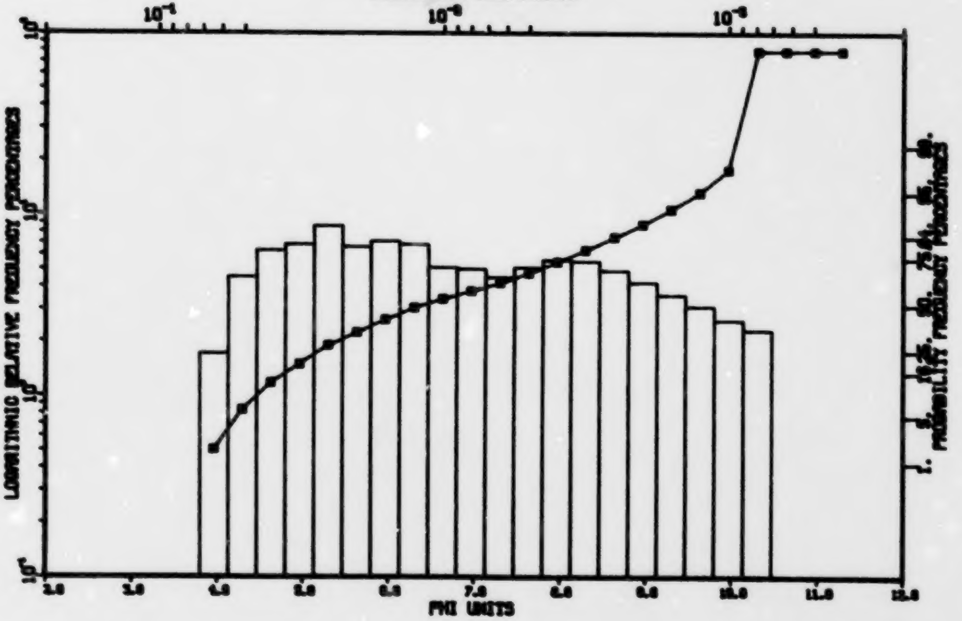
SAMPLE NO. - 1011 J. SYVITSKI 8317082
IT-1.28 200 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



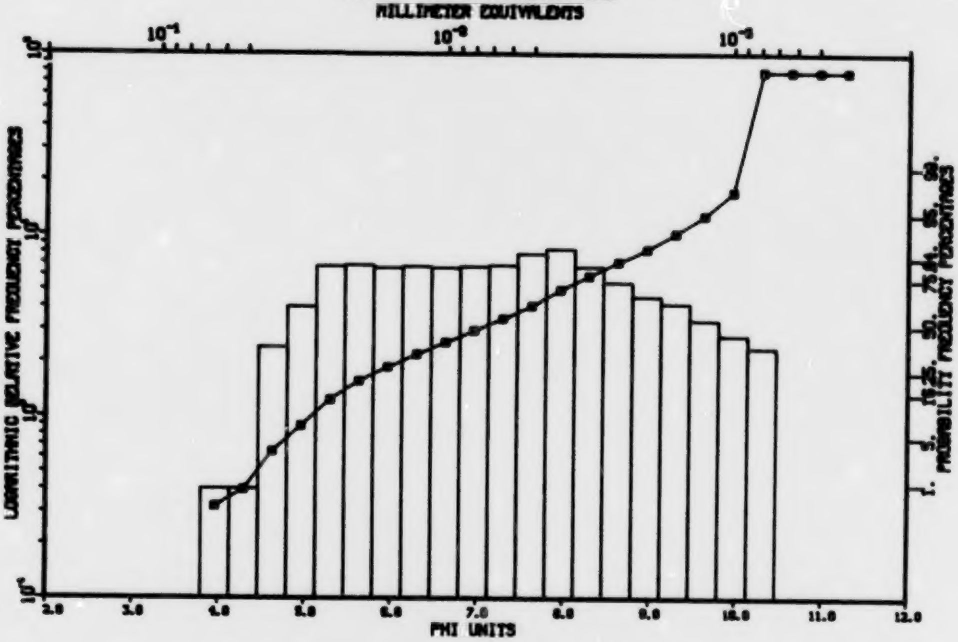
SAMPLE NO. - 1012 J. SYVITSKI 8317081
IT-1.2B 275 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



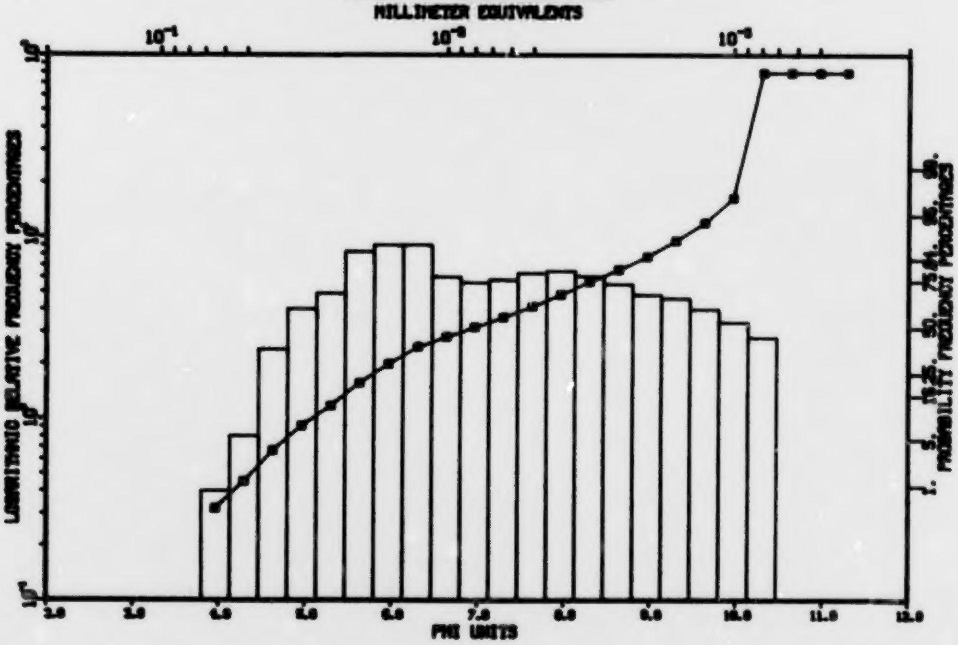
SAMPLE NO. - 1013 J. SYVITSKI 8317707
IT-2.1 1 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



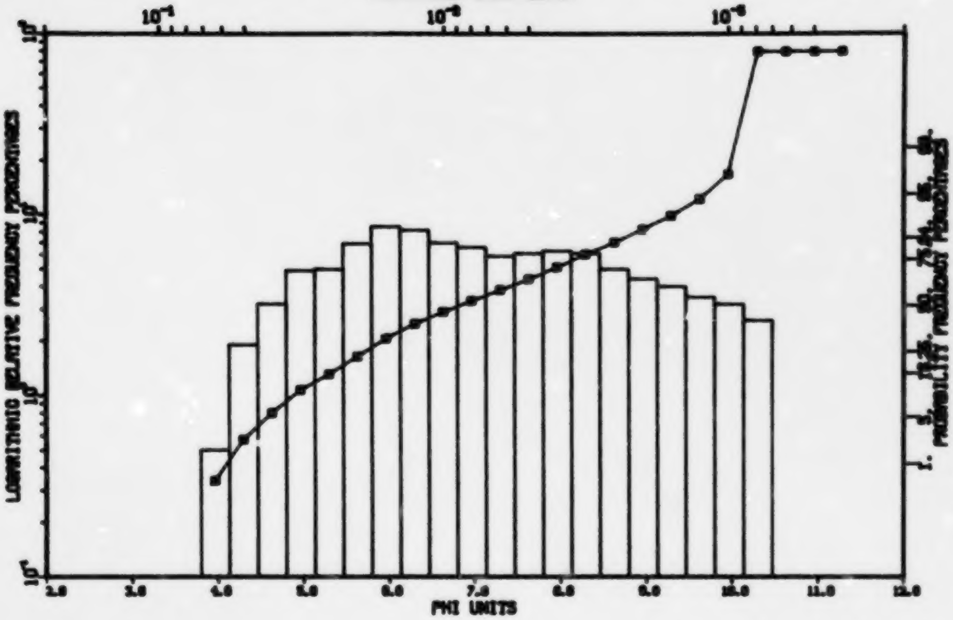
SAMPLE NO. - 1014 J. SYVITSKI 8317703
IT-2.1 30 ITIRBILUNG FJORD



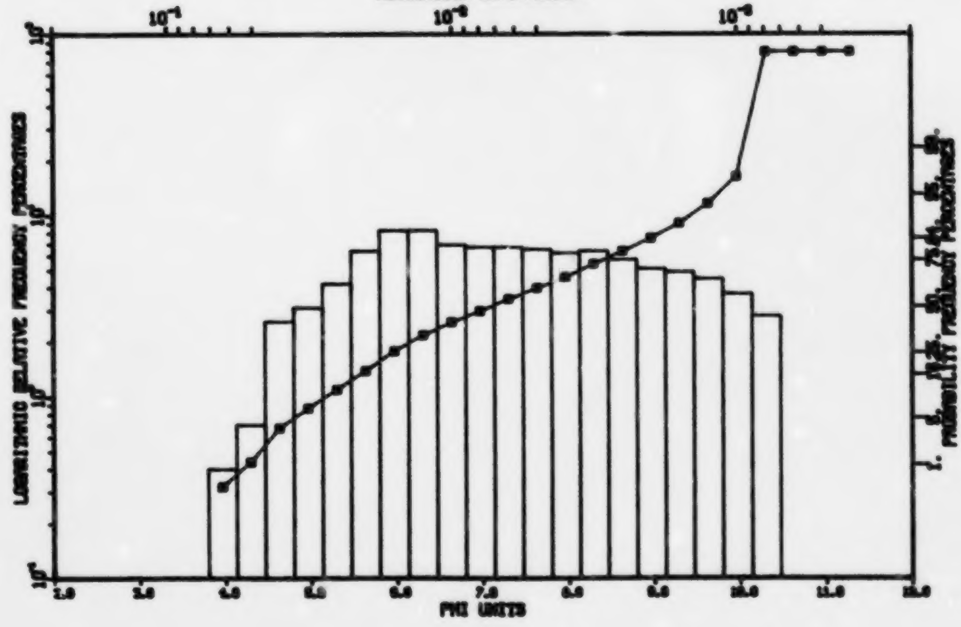
SAMPLE NO. - 1015 J. SYVITSKI 8317702
IT-2.1 90 ITIRBILUNG FJORD



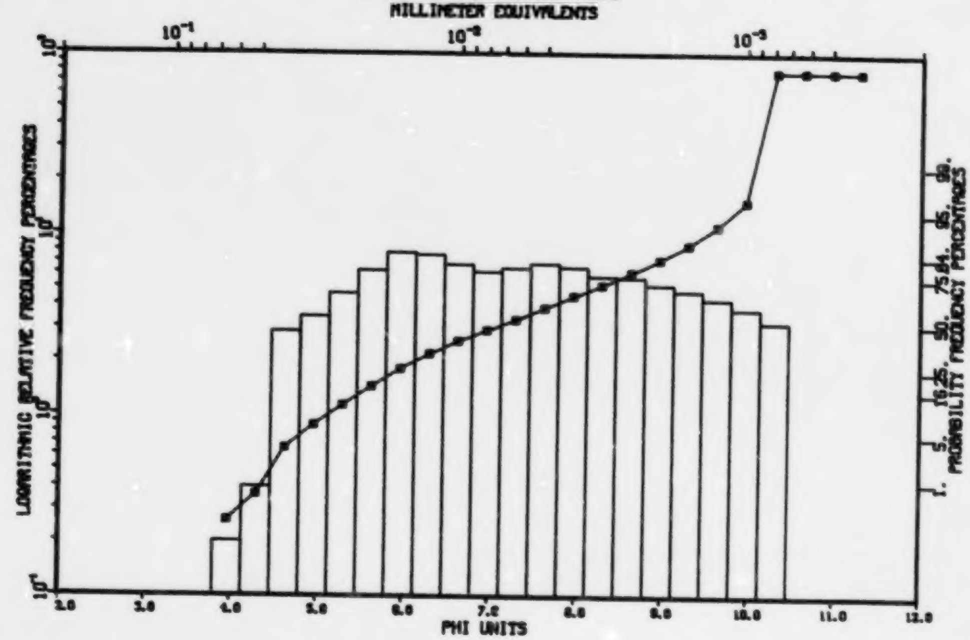
SAMPLE NO. - 1016 J. SYVITSKI 8317701
IT-2.1 100 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



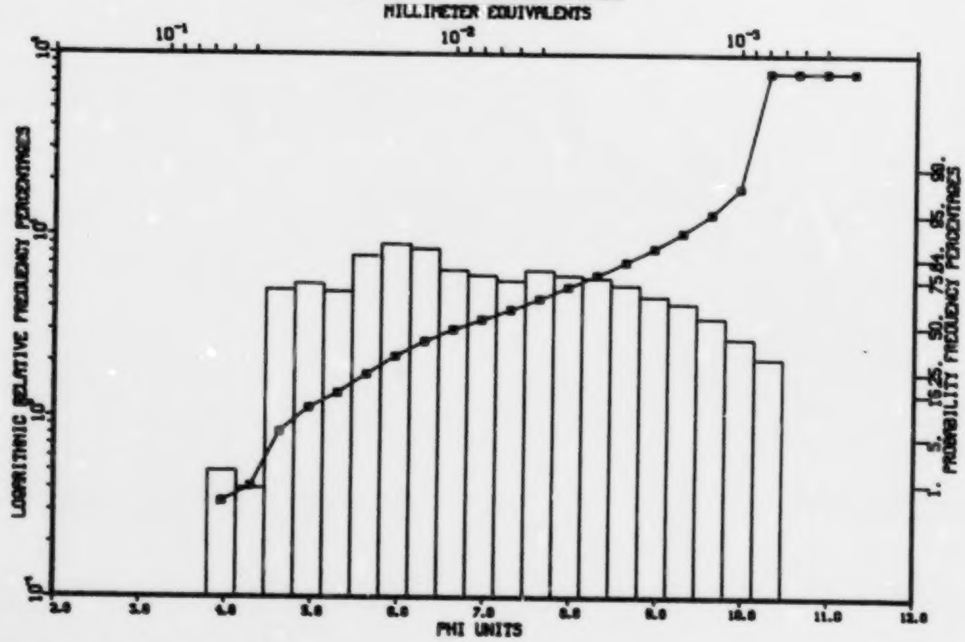
SAMPLE NO. - 1017 J. SYVITSKI 8317800
IT-2.1 330 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



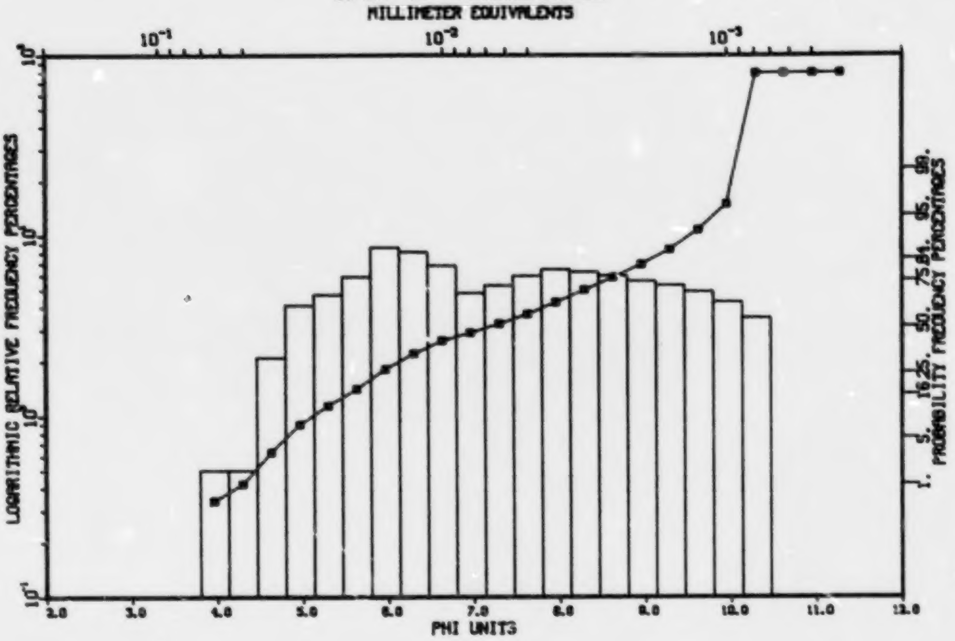
SAMPLE NO. - 1018 J. SYVITSKI 8317088
IT-2.2 1 ITIRBILUNG FJORD



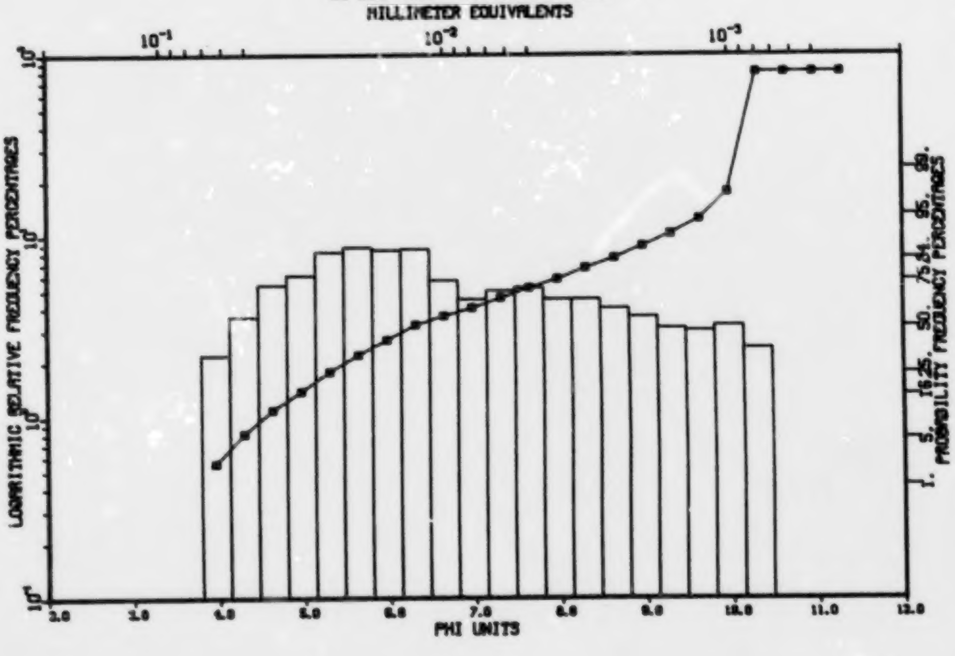
SAMPLE NO. - 1019 J. SYVITSKI 8317088
IT-2.2 10 ITIRBILUNG FJORD



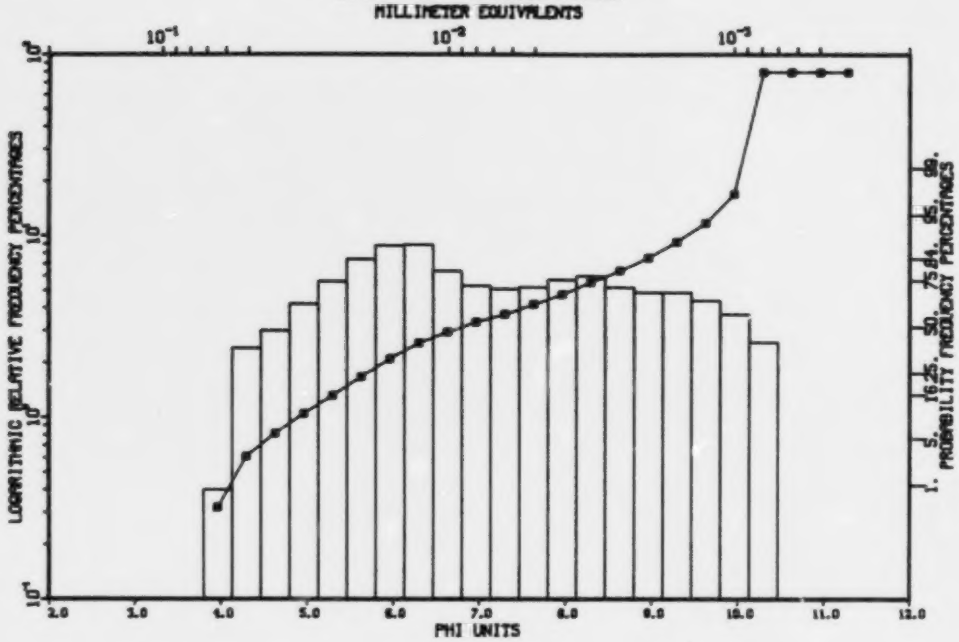
SAMPLE NO. - 1020 J. SYVITSKI 8317885
IT-2.2 20 ITIRBILUNG FJORD



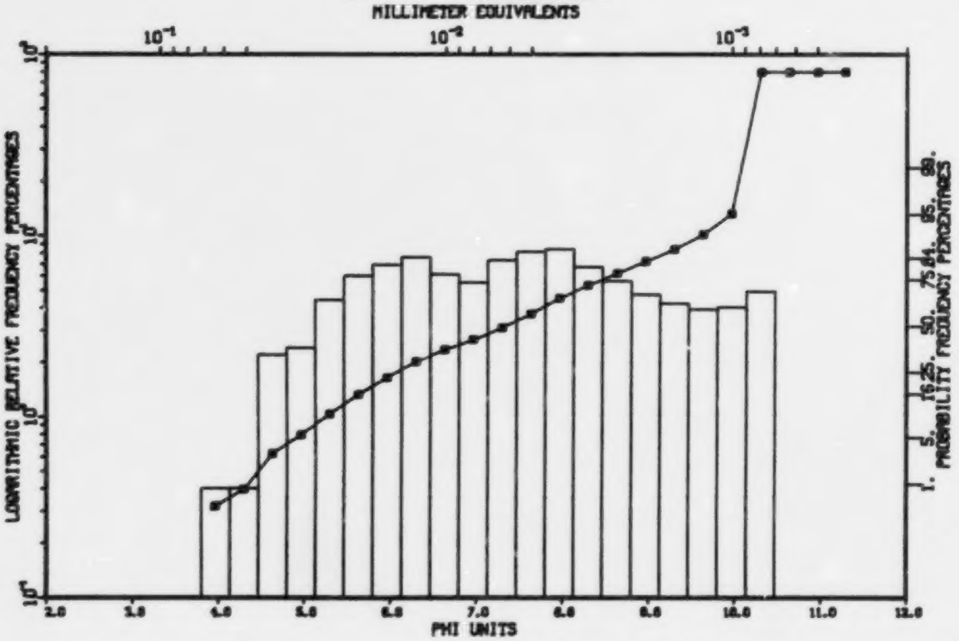
SAMPLE NO. - 1021 J. SYVITSKI 8317882
IT-2.2 100 ITIRBILUNG FJORD



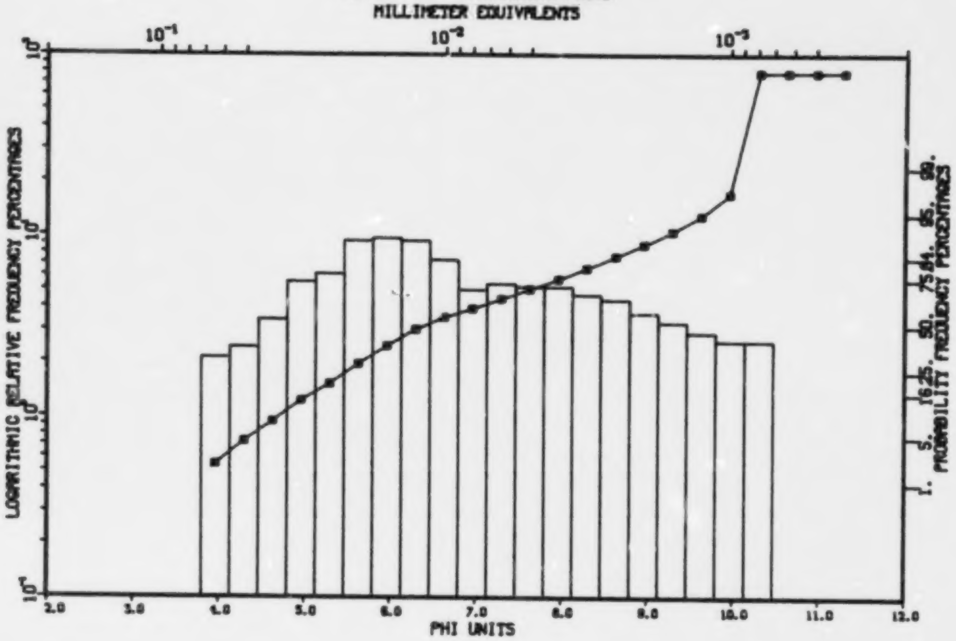
SAMPLE NO. - 1022 J. SYVITSKI 8317880
IT-2.2 387 ITIRBILUNG FJORD



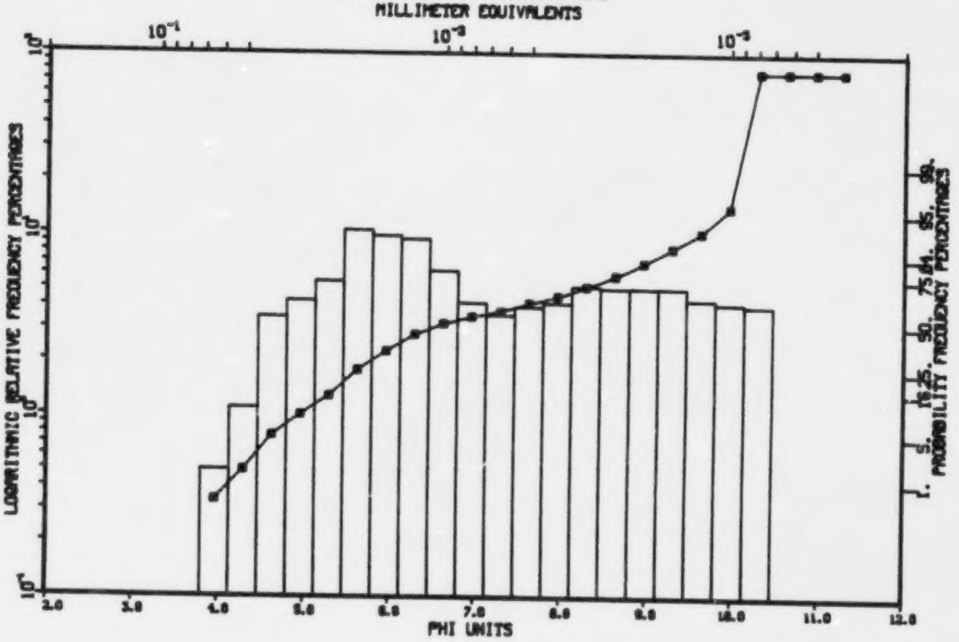
SAMPLE NO. - 1023 J. SYVITSKI 8317716
IT-2.3 1 ITIRBILUNG FJORD



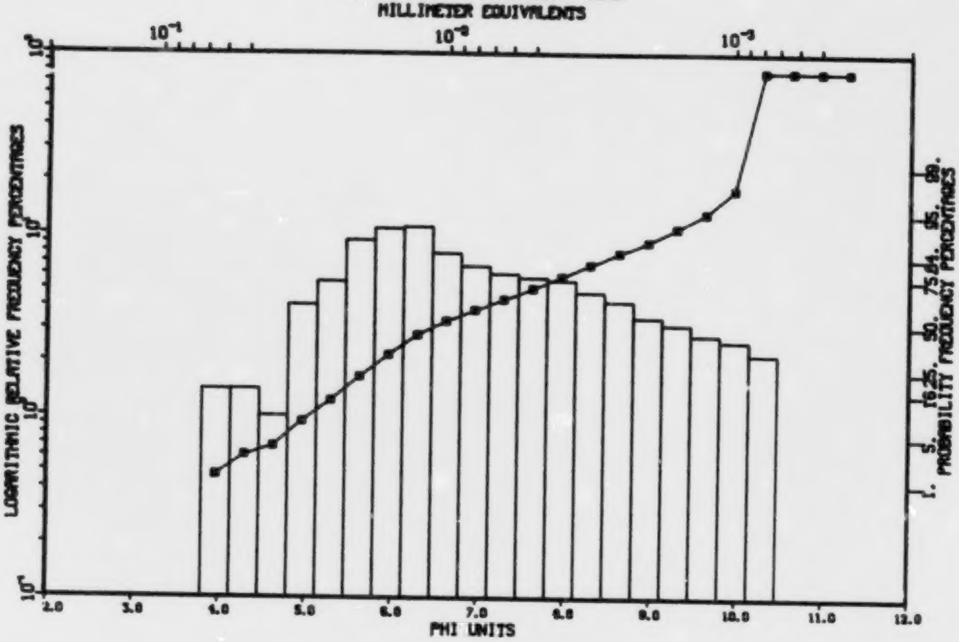
SAMPLE NO. - 1024 J. SYVITSKI 8317714
IT-2.3 10 ITIRBILUNG FJORD



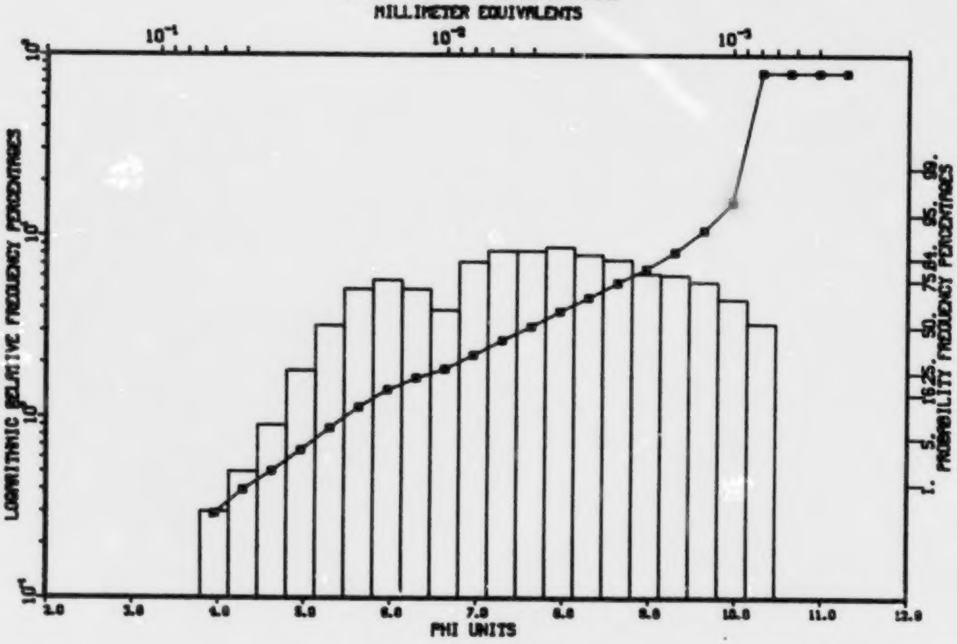
SAMPLE NO. - 1025 J. SYVITSKI 8317713
IT-2.3 20 ITIRBILUNG FJORD



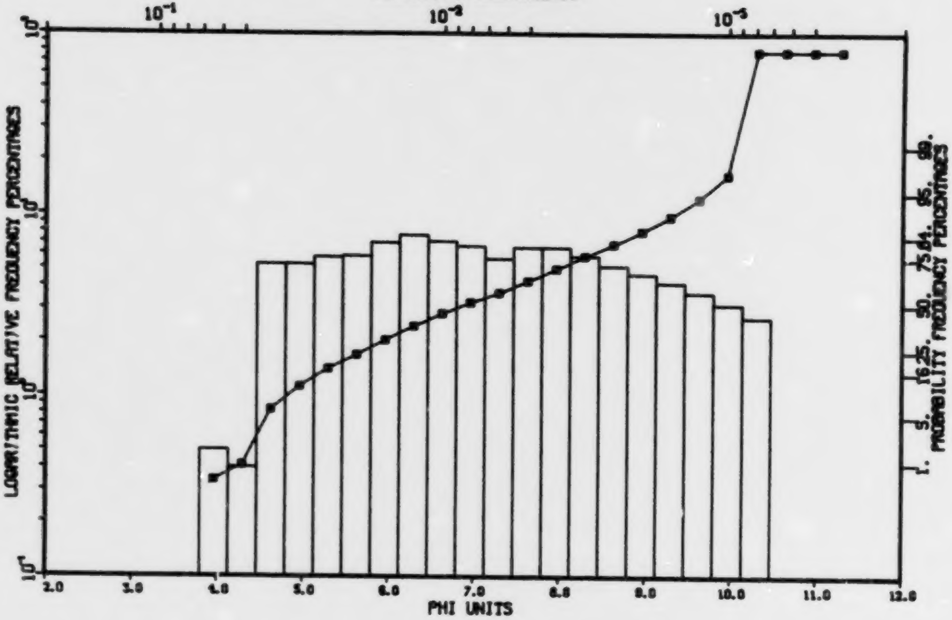
SAMPLE NO. - 1026 J. SYVITSKI 8317711
IT-2.3 100 ITIRBILUNG FJORD



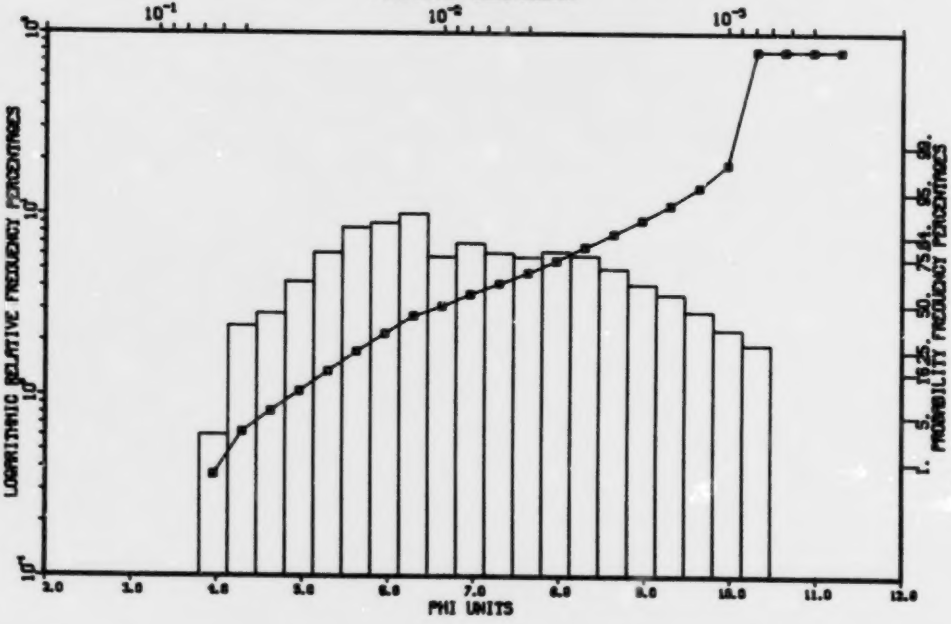
SAMPLE NO. - 1027 J. SYVITSKI 8317708
IT-2.3 395 ITIRBILUNG FJORD



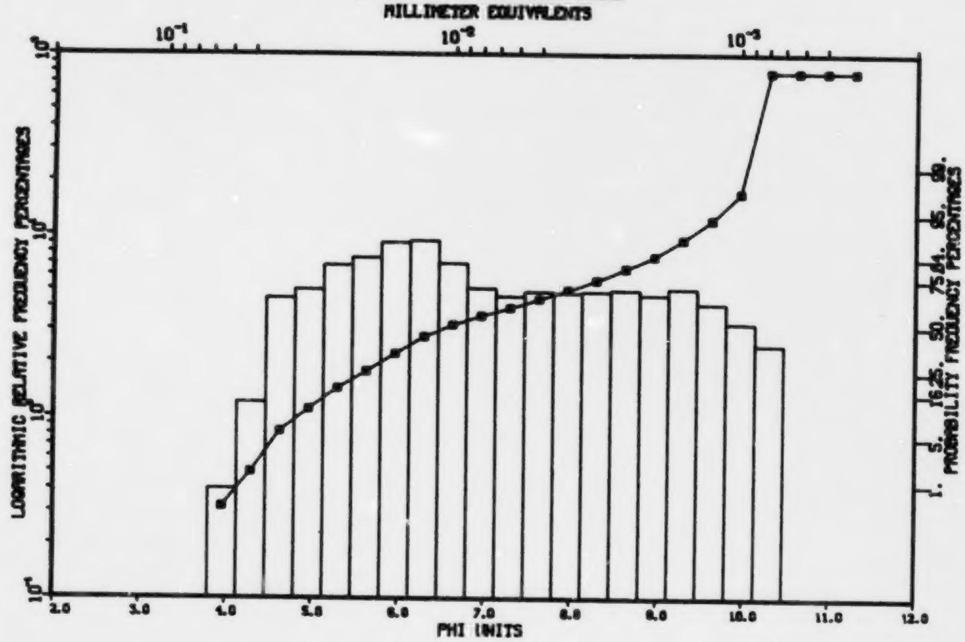
SAMPLE NO. - 1028 J. SYVITSKI 8317724
IT-3.1 5 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



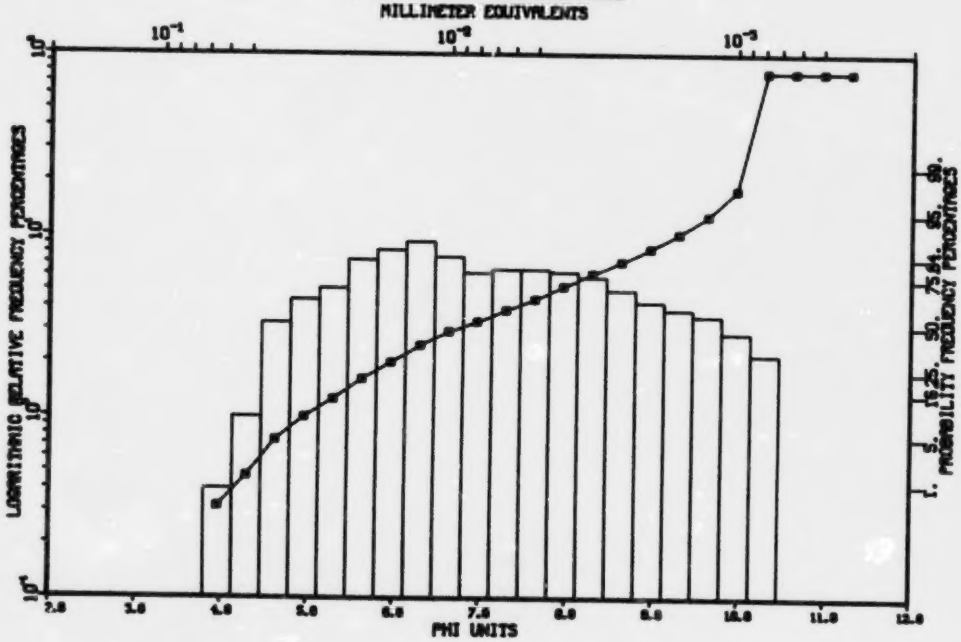
SAMPLE NO. - 1029 J. SYVITSKI 8317723
IT-3.1 20 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



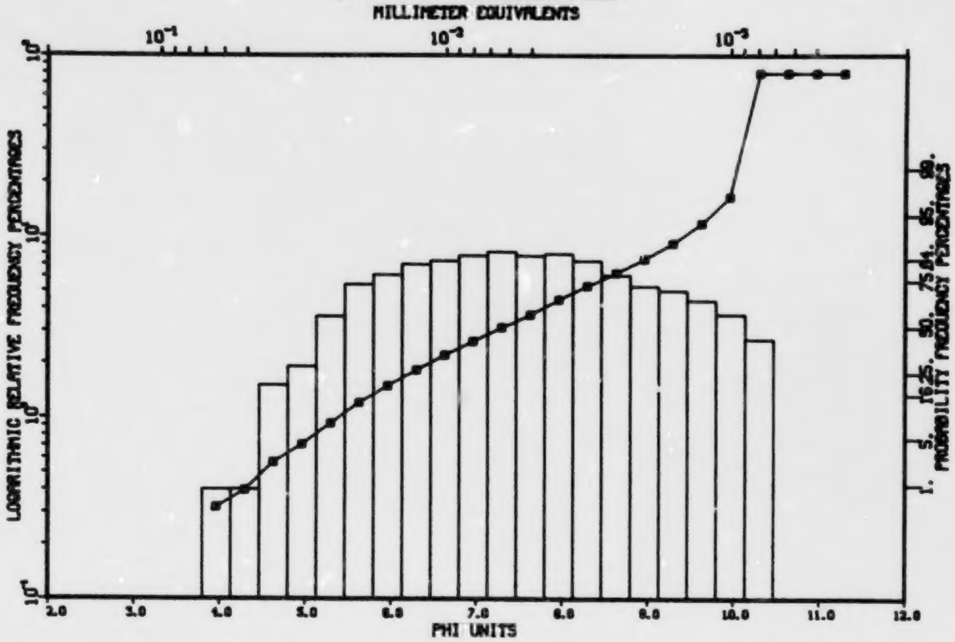
SAMPLE NO. - 1030 J. SYVITSKI 8317722
IT-3.1 30 ITIRBILUNG FJORD



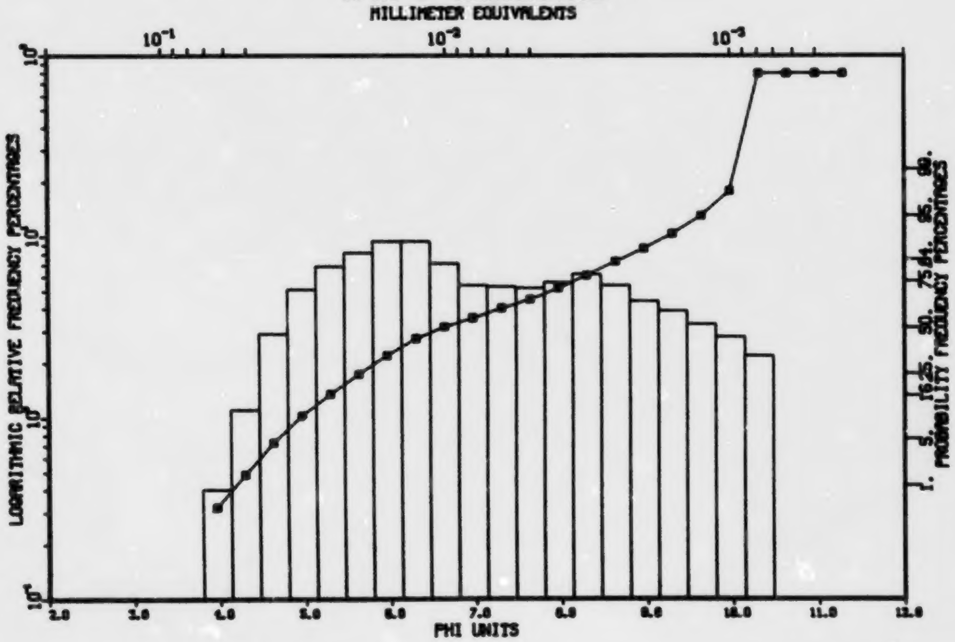
SAMPLE NO. - 1031 J. SYVITSKI 8317718
IT-3.1 270 ITIRBILUNG FJORD



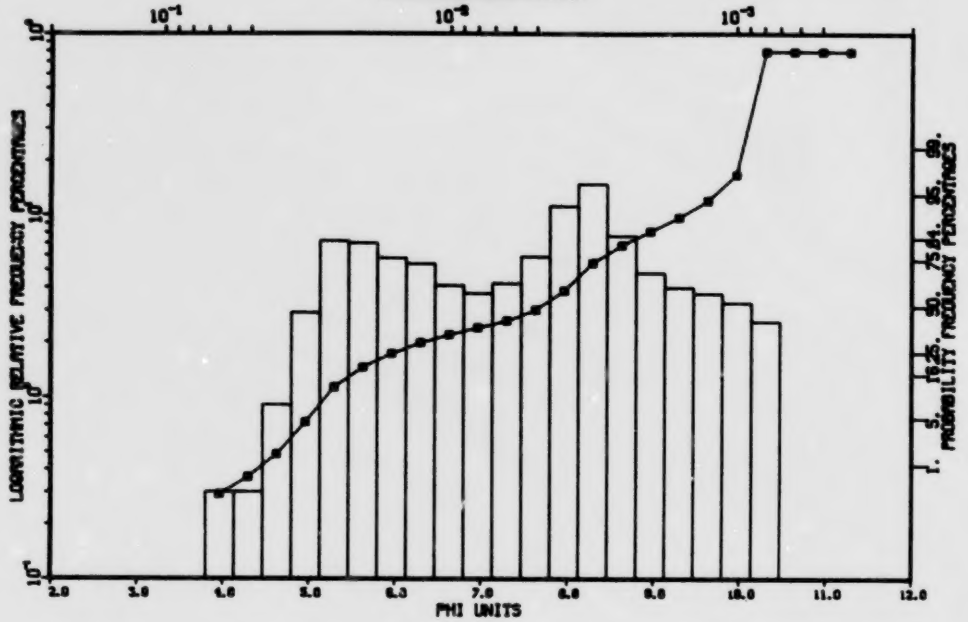
SAMPLE NO. - 1032 J. SYVITSKI 8317717
IT-3.1 345 ITIRBILUNG FJORD



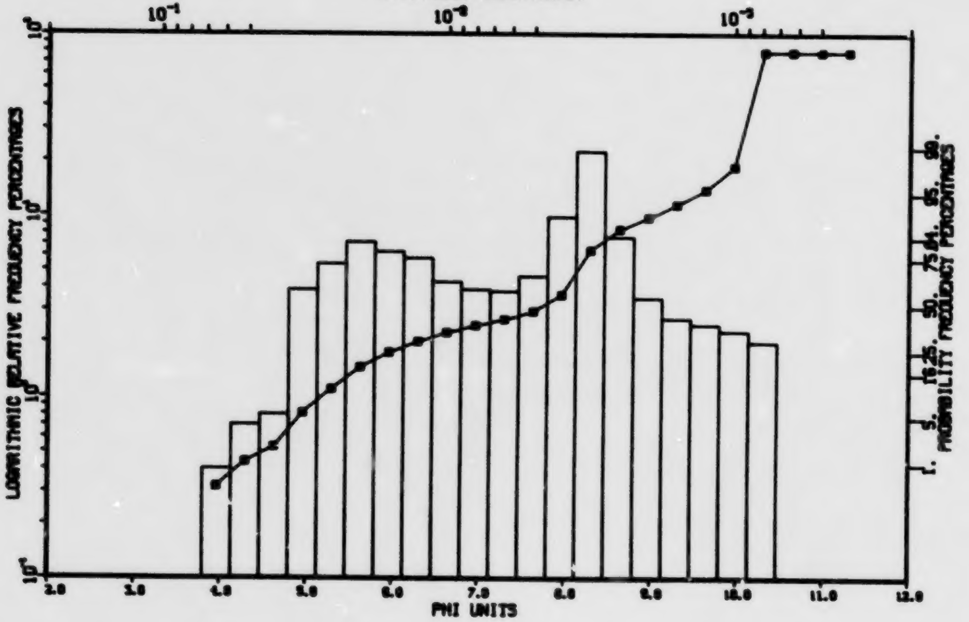
SAMPLE NO. - 1033 J. SYVITSKI 8317634
IT-6.0 5 ITIRBILUNG FJORD



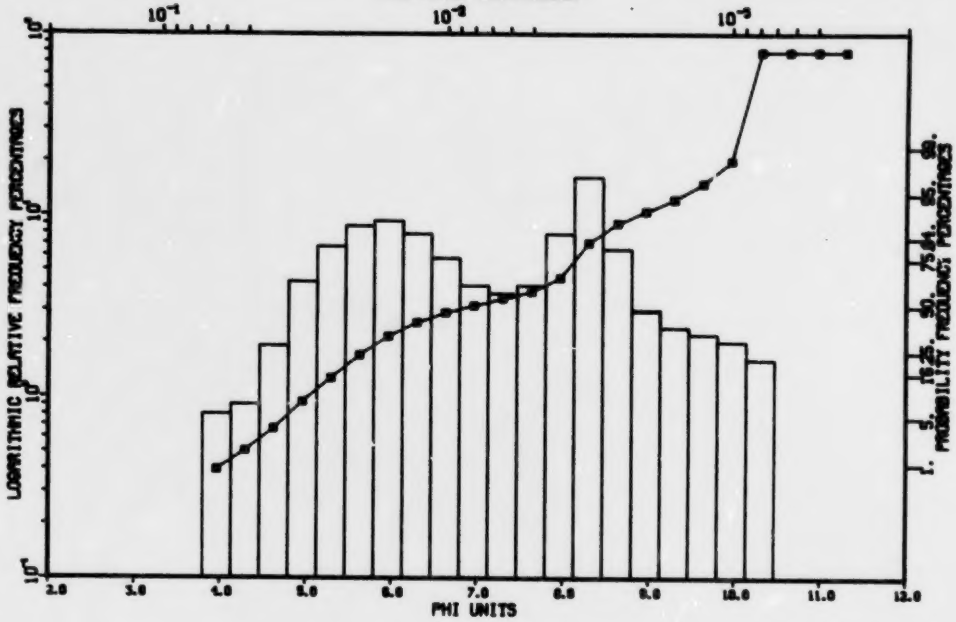
SAMPLE NO. - 1034 J. SYVITSKI 8317633
IT-6.0 30 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



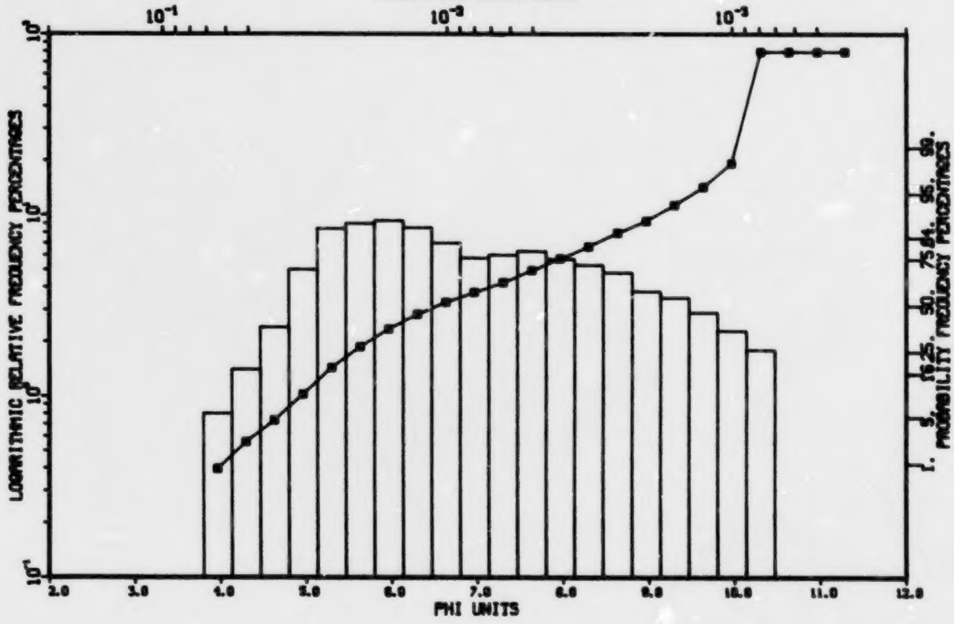
SAMPLE NO. - 1035 J. SYVITSKI 8317632
IT-6.0 40 ITIRBILUNG FJORD
MILLIMETER EQUIVALENTS



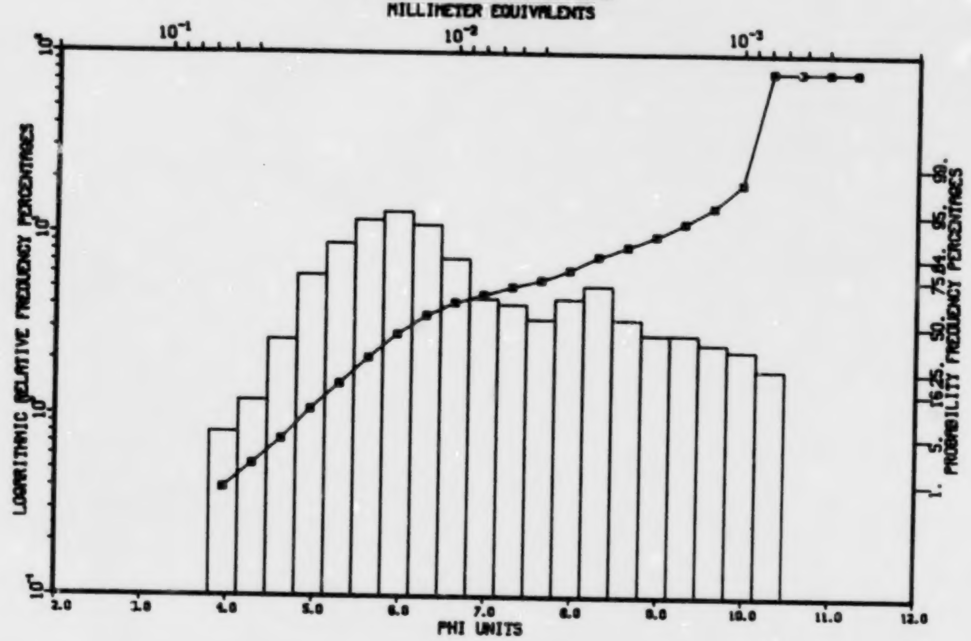
SAMPLE NO. - 1036 J. SYVITSKI 8317631
IT-6.0 50 ITIRBILUNG FJORD



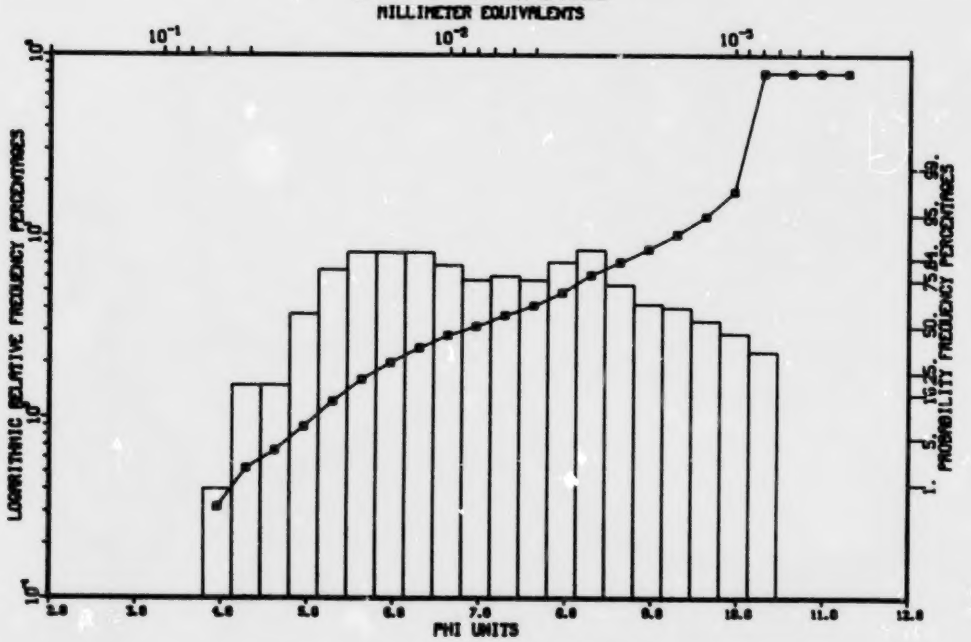
SAMPLE NO. - 1037 J. SYVITSKI 8317627
IT-6.0 535 ITIRBILUNG FJORD



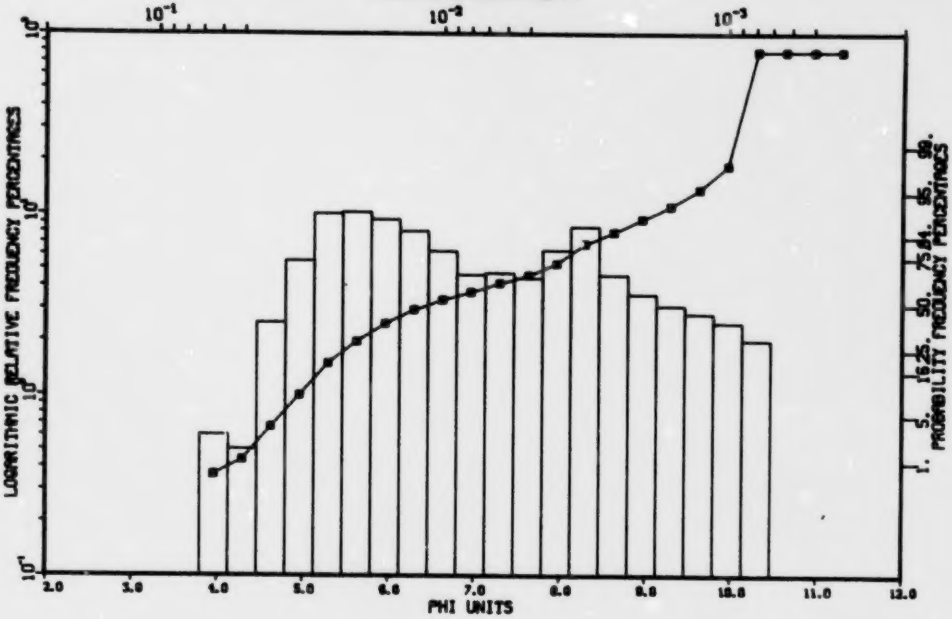
SAMPLE NO. - 908 J. SYVITSKI 8317563
CA-0.2 1 CAMBRIDGE FJORD



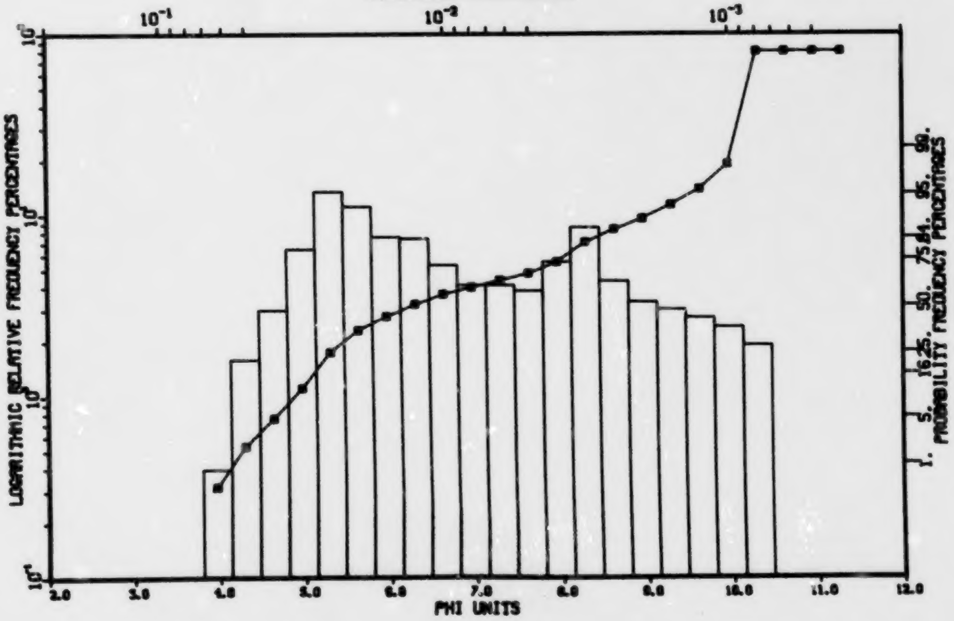
SAMPLE NO. - 909 J. SYVITSKI 8317562
CA-0.2 5 CAMBRIDGE FJORD

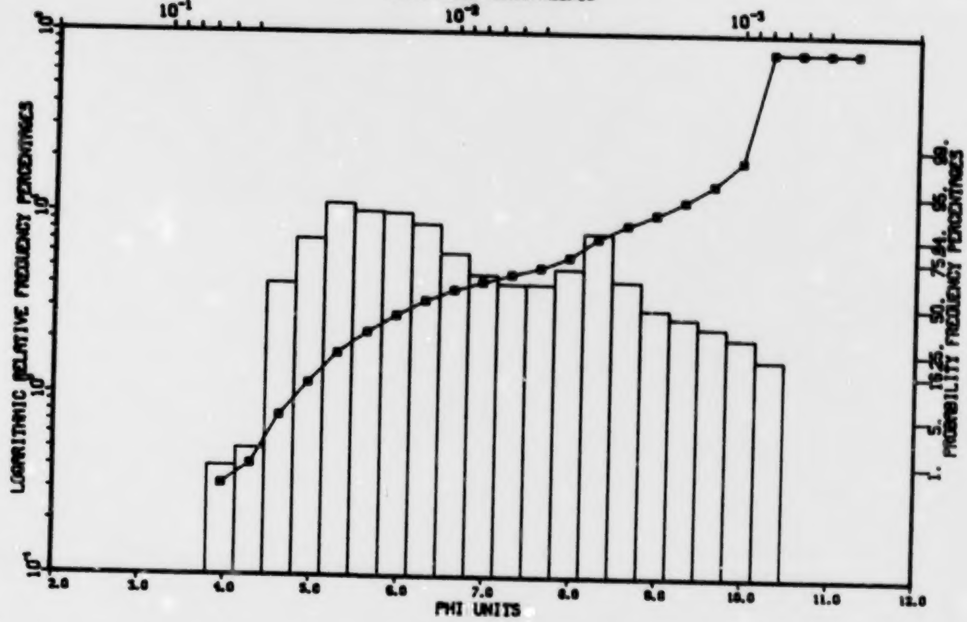


SAMPLE NO. - 910 J. SYVITSKI 8317581
CA-0.2 10 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS

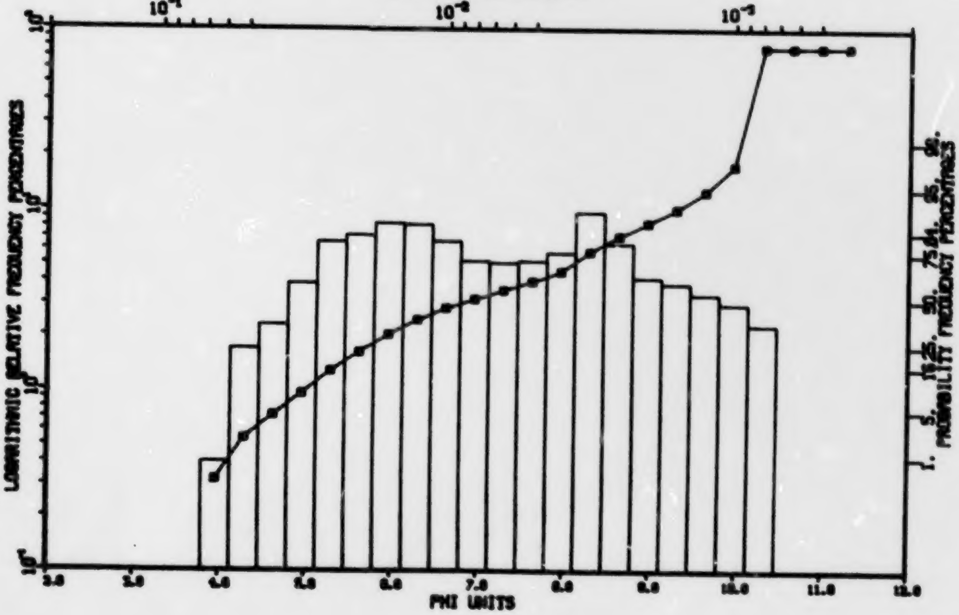


SAMPLE NO. - 911 J. SYVITSKI 8317580
CA-0.2 20 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



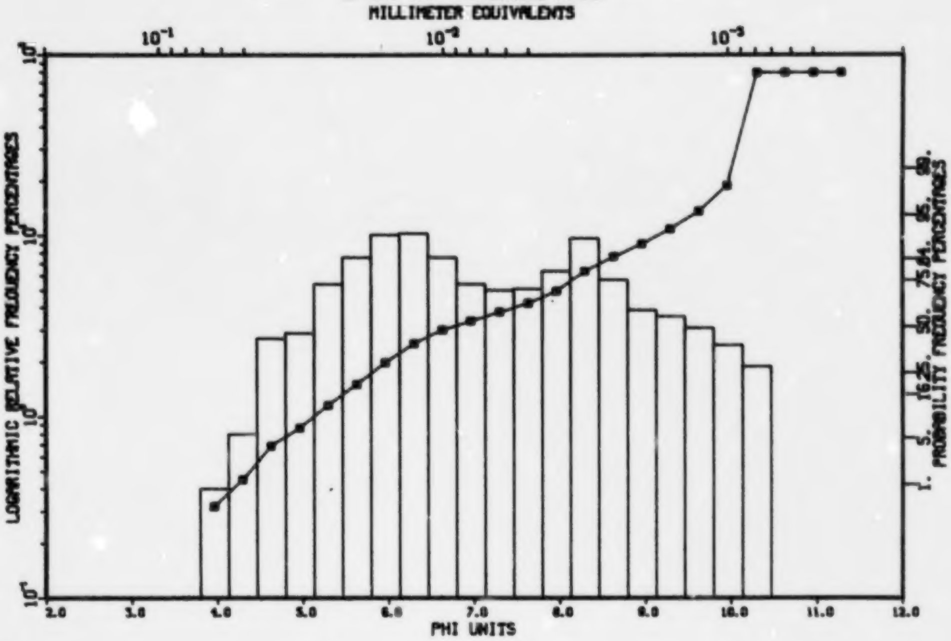


SAMPLE NO. - 012 J. SYVITSKI 8317550
CA-0.2 30 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS

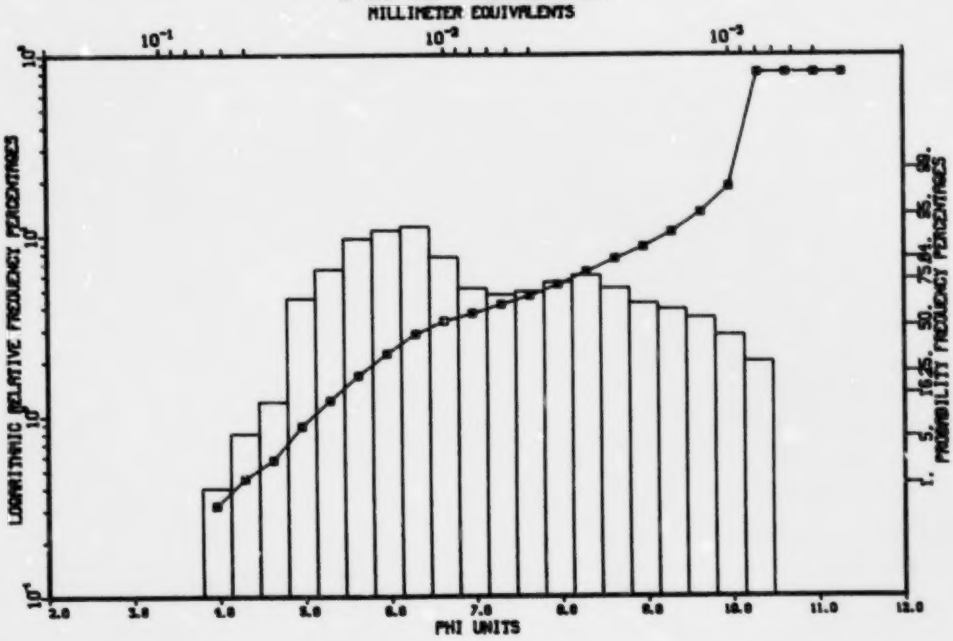


SAMPLE NO. - 013 J. SYVITSKI 8317550
CA-0.2 50 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS

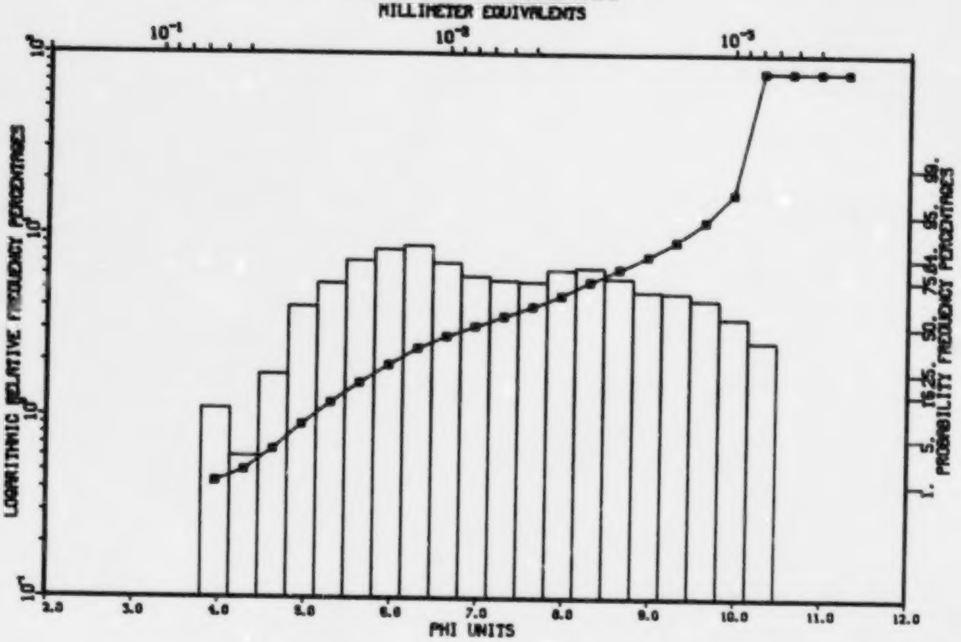
SAMPLE NO. - 914 J. SYVITSKI 8317557
CA-0.2 75 CAMBRIDGE FJORD



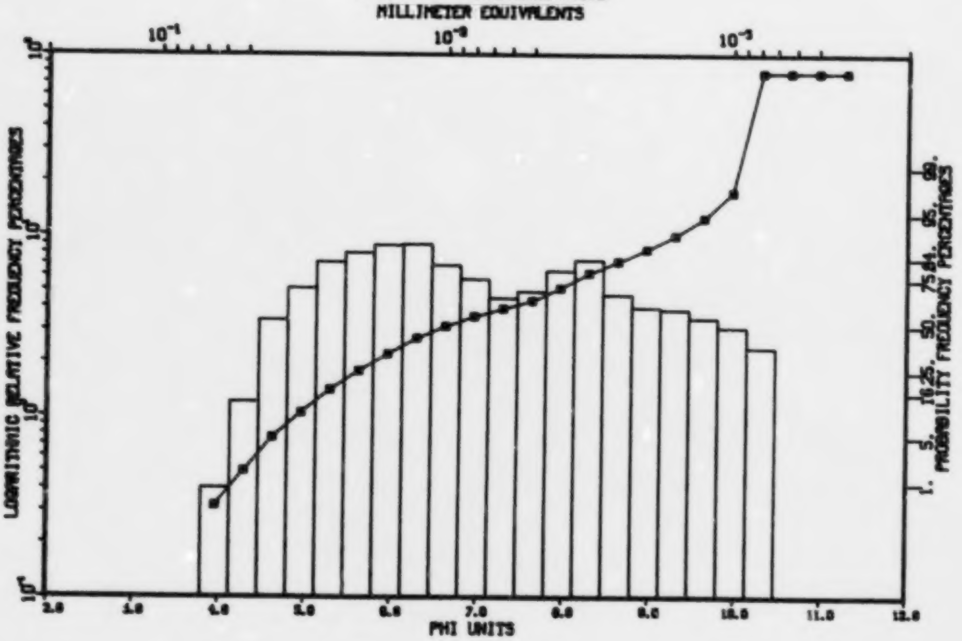
SAMPLE NO. - 915 J. SYVITSKI 8317556
CA-0.2 100 CAMBRIDGE FJORD



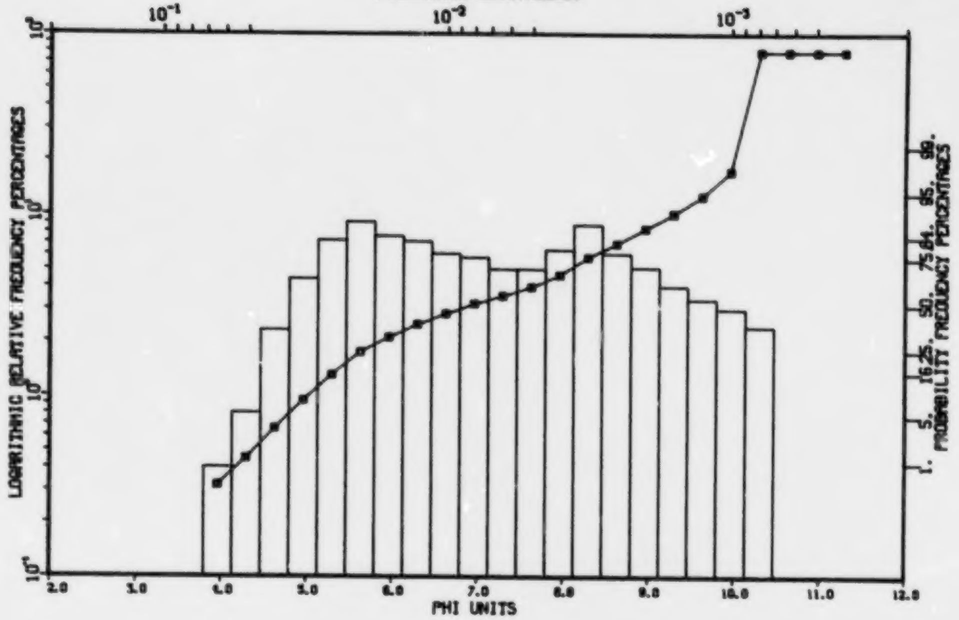
SAMPLE NO. - 916 J. SYVITSKI 8317555
CA-0.2 119 CAMBRIDGE FJORD



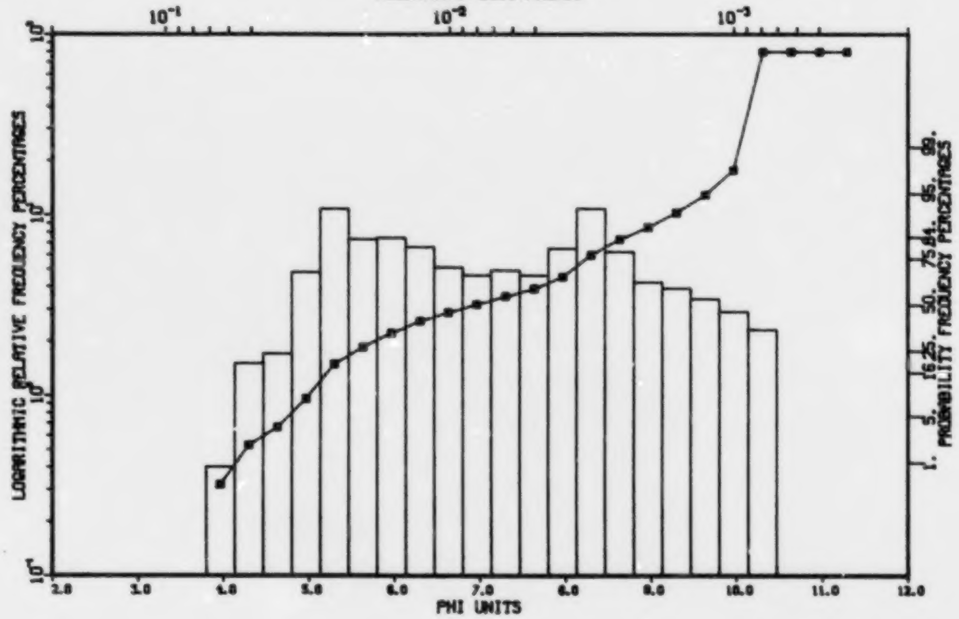
SAMPLE NO. - 917 J. SYVITSKI 8317545
CA-1.0 1 CAMBRIDGE FJORD



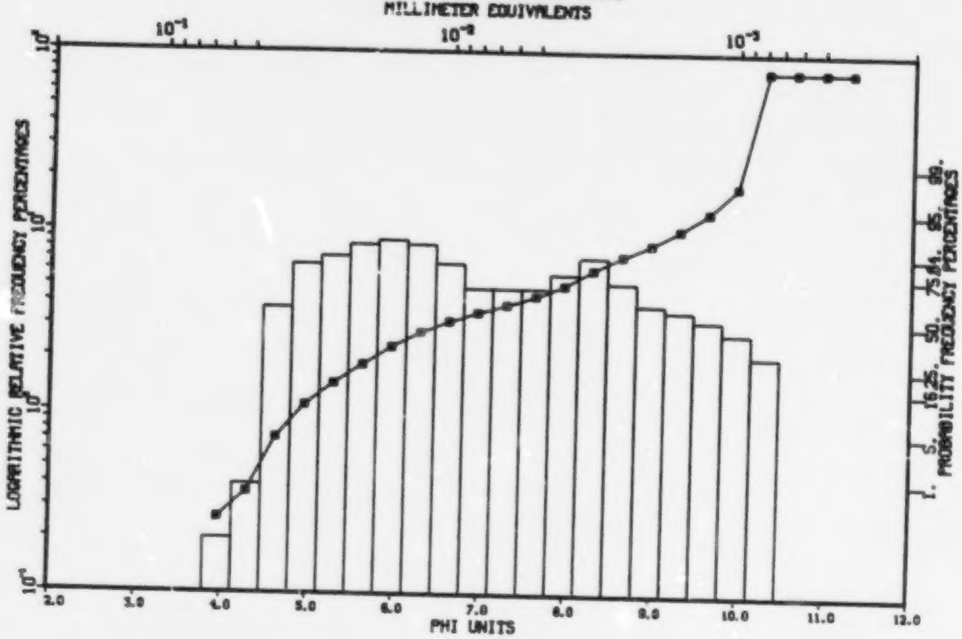
SAMPLE NO. - 918 J. SYVITSKI 8317543
CA-1.0 10 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



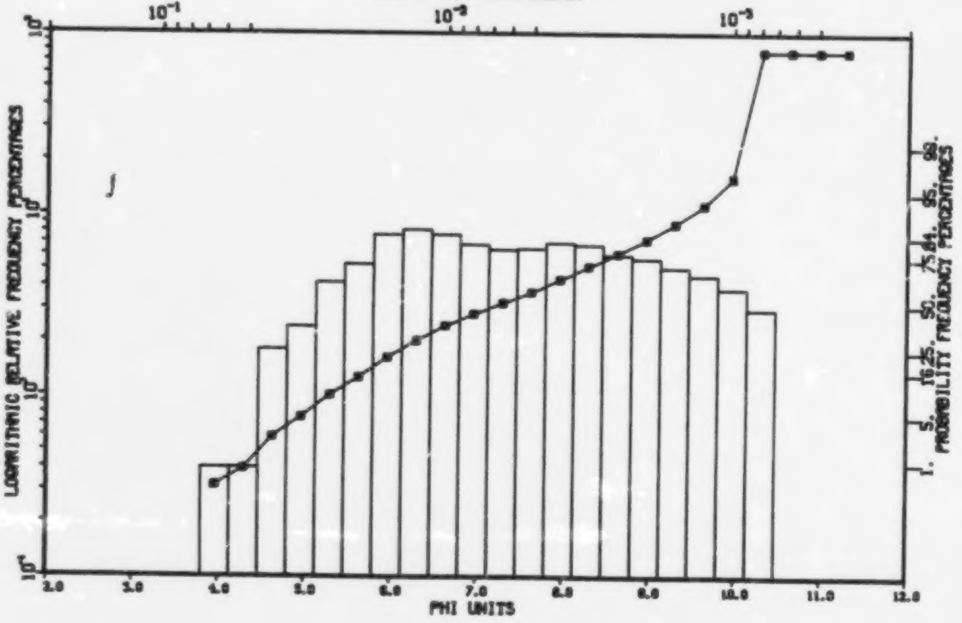
SAMPLE NO. - 919 J. SYVITSKI 8317541
CA-1.0 35 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



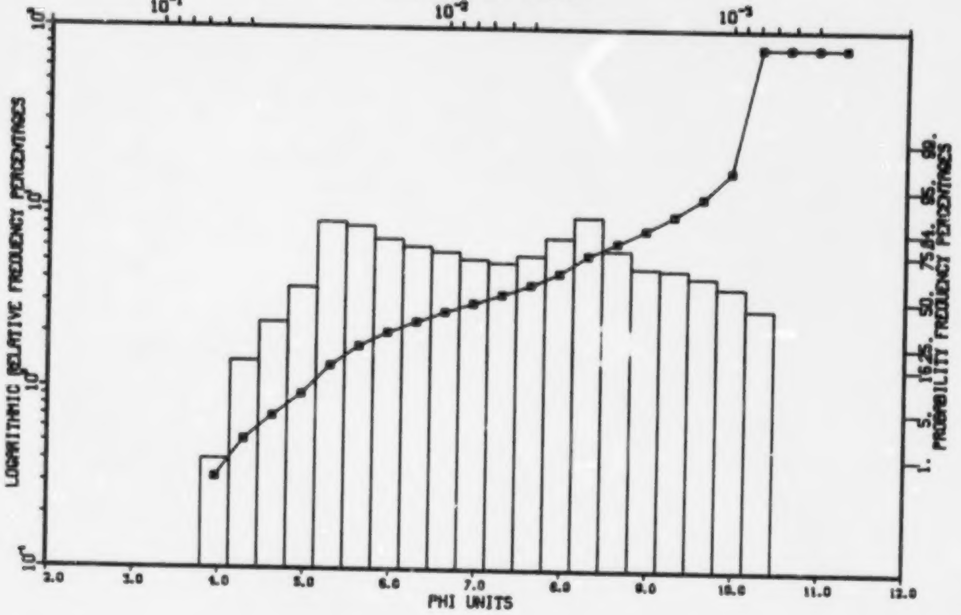
SAMPLE NO. - 820 J. SYVITSKI 8317538
CA-1.0 100 CAMBRIDGE FJORD



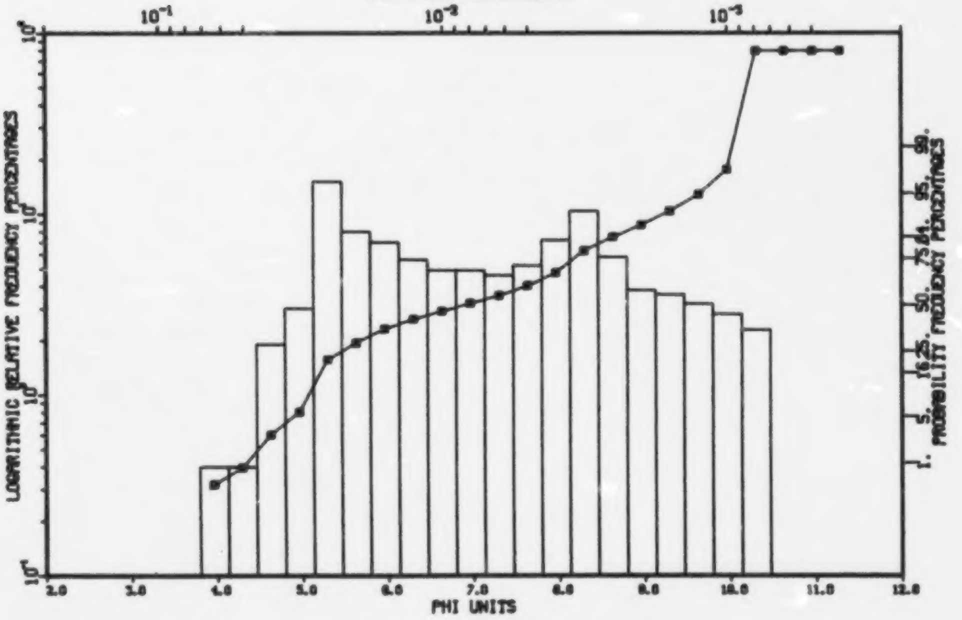
SAMPLE NO. - 821 J. SYVITSKI 8317537
CA-1.0 165 CAMBRIDGE FJORD



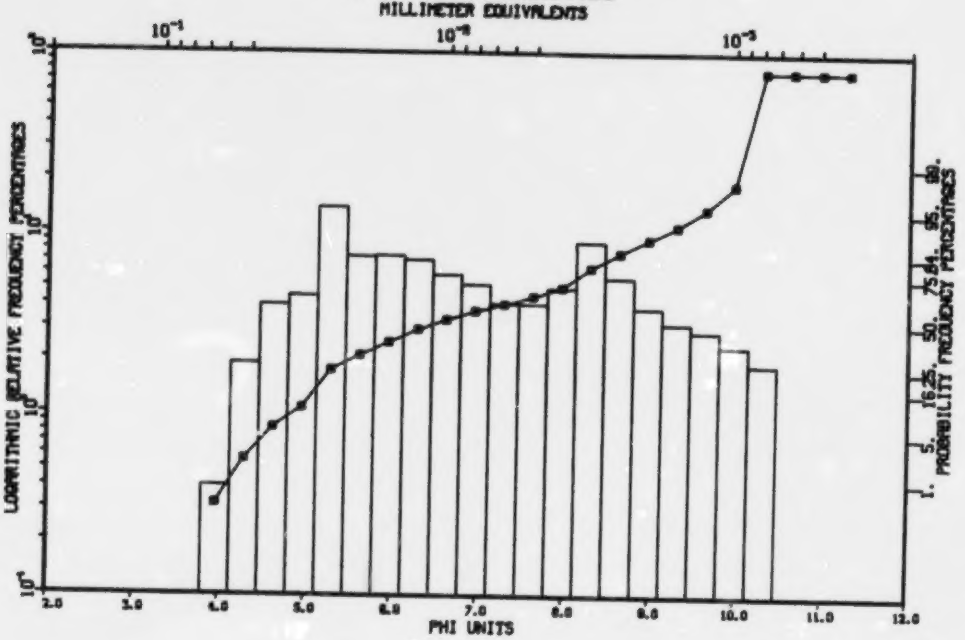
SAMPLE NO. - 922 J. SYVITSKI 8317554
CA-1.2 1 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



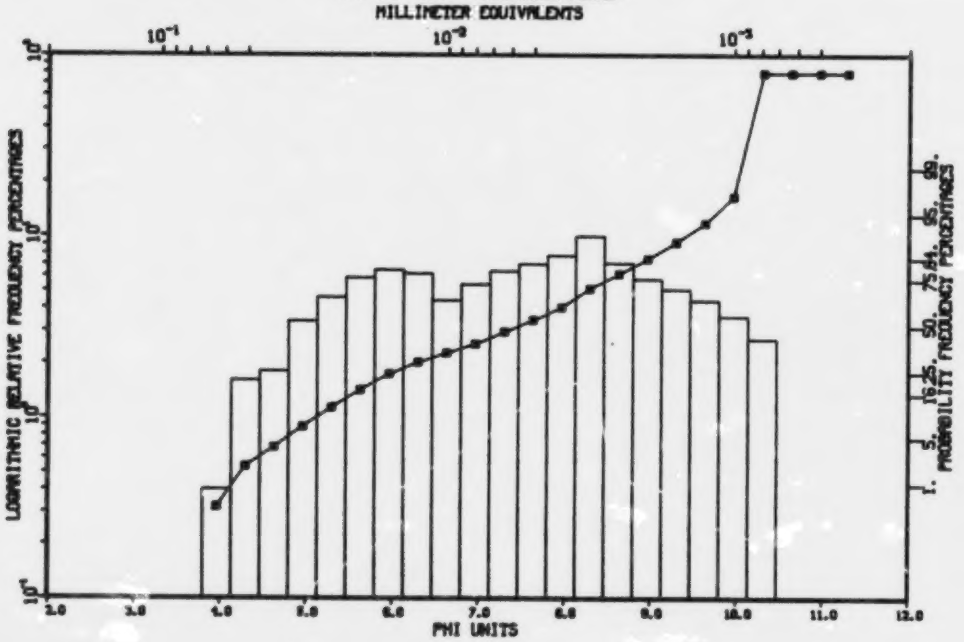
SAMPLE NO. - 923 J. SYVITSKI 8317551
CA-1.2 23 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



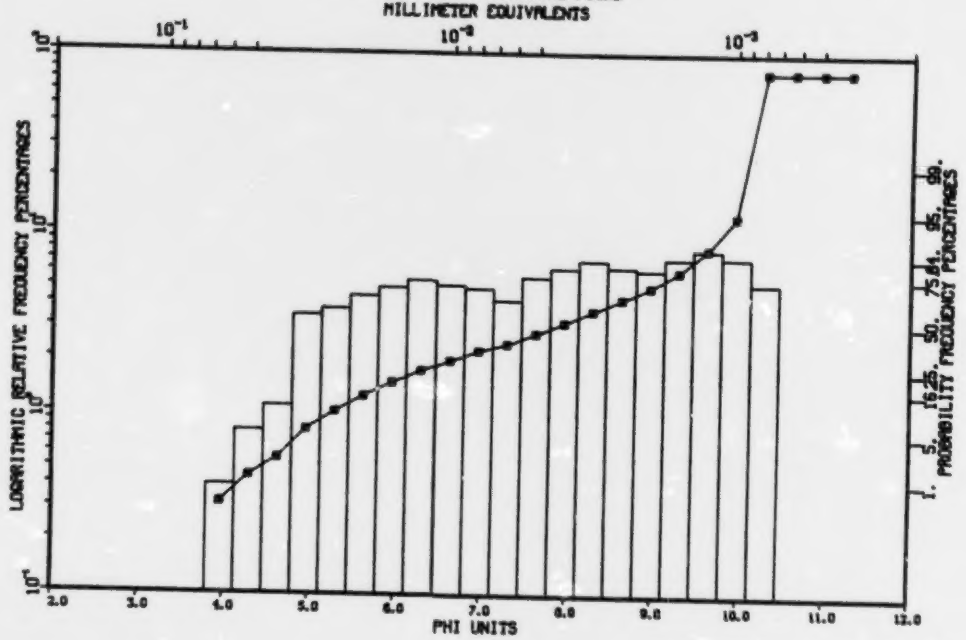
SAMPLE NO. - 024 J. SYVITSKI 0317551
CA-1.2 53 CAMBRIDGE FJORD



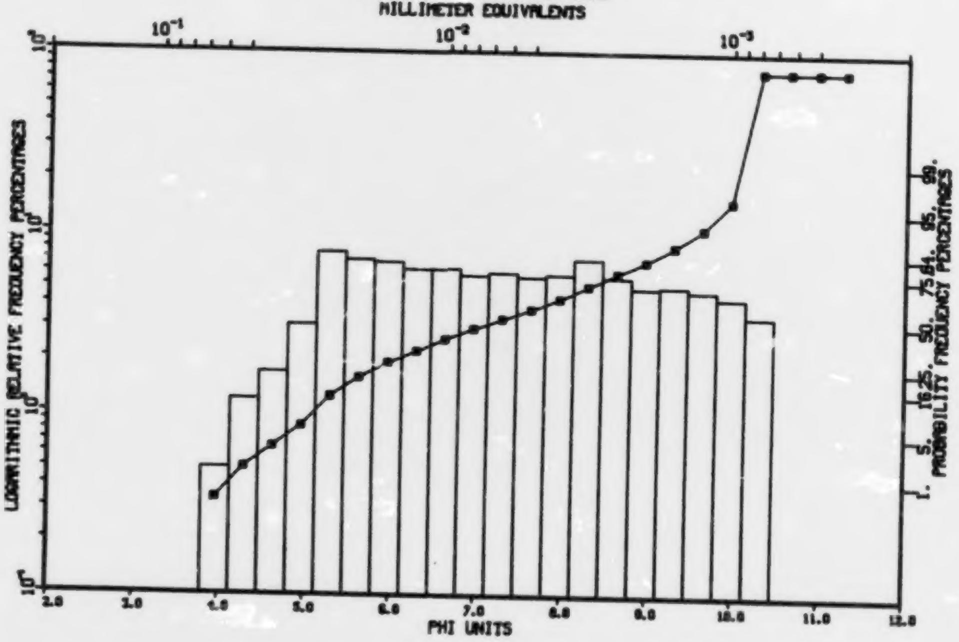
SAMPLE NO. - 025 J. SYVITSKI 0317540
CA-1.2 103 CAMBRIDGE FJORD



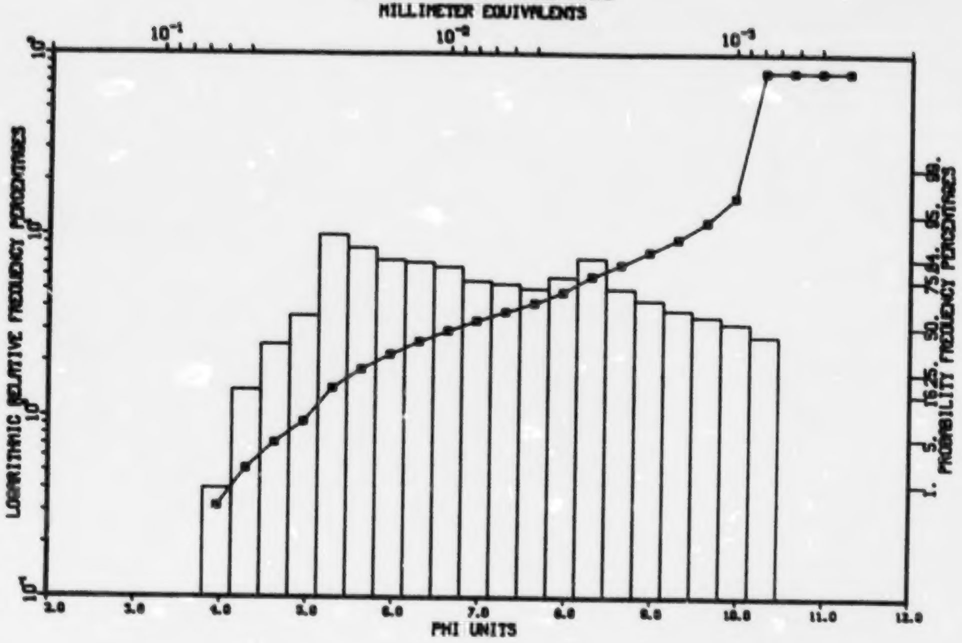
SAMPLE NO. - 926 J. SYVITSKI 8317546
CA-1.2 193 CAMBRIDGE FJORD



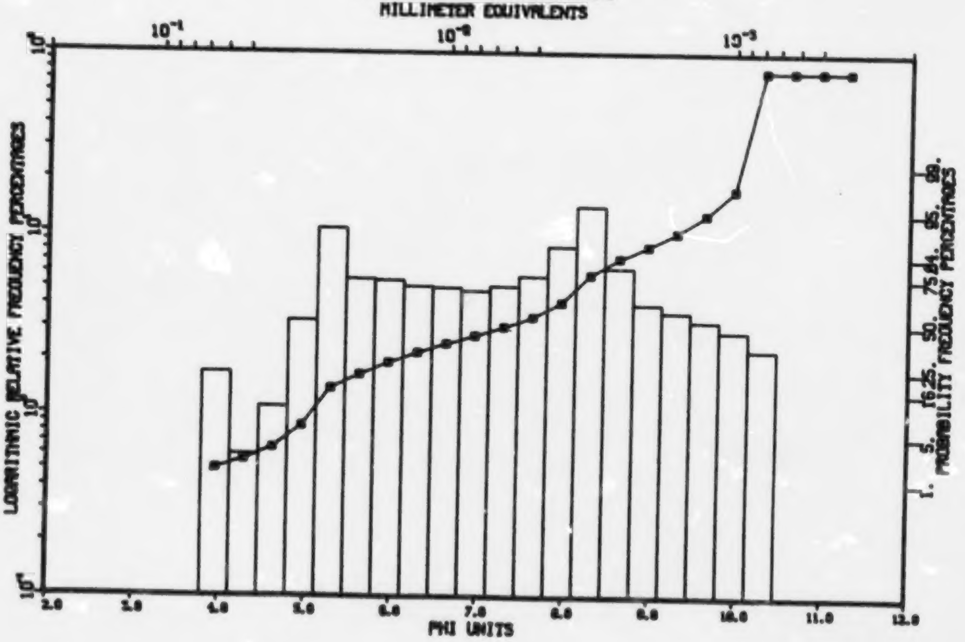
SAMPLE NO. - 927 J. SYVITSKI 8317590
CA-2.0 1 CAMBRIDGE FJORD



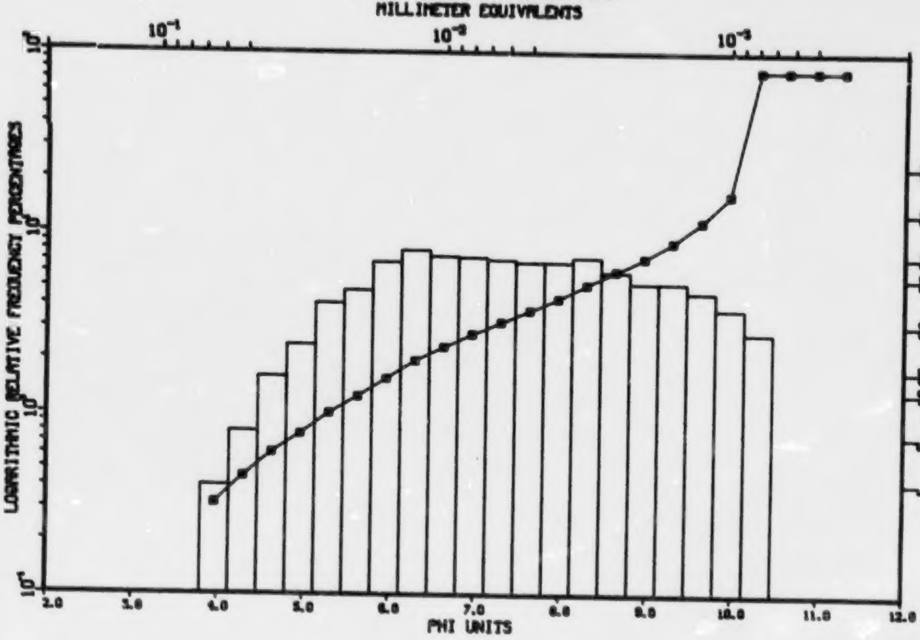
SAMPLE NO. - 928 J. SYVITSKI 8317587
CA-2.0 20 CAMBRIDGE FJORD



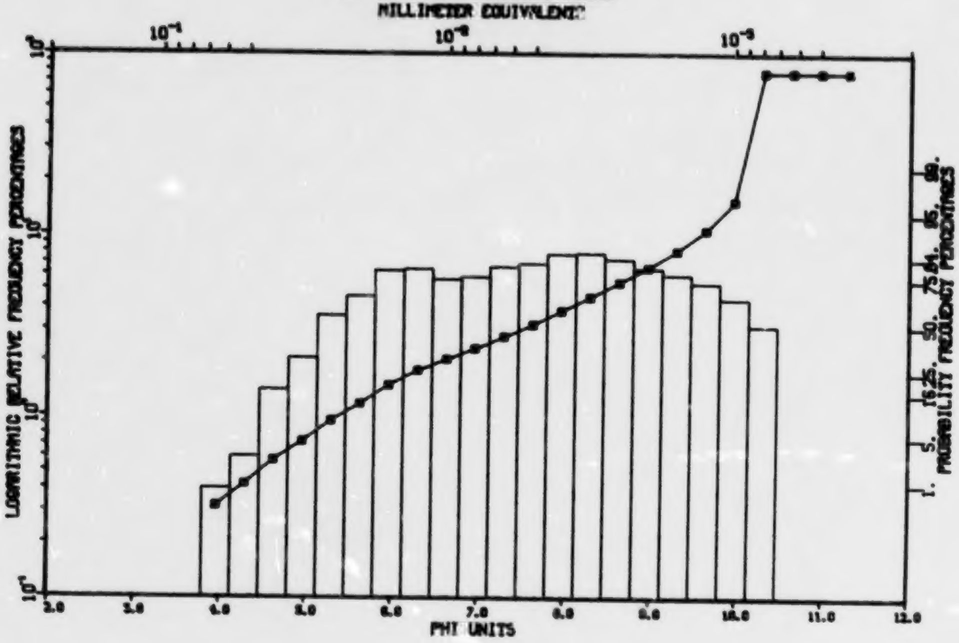
SAMPLE NO. - 929 J. SYVITSKI 8317585
CA-2.0 50 CAMBRIDGE FJORD



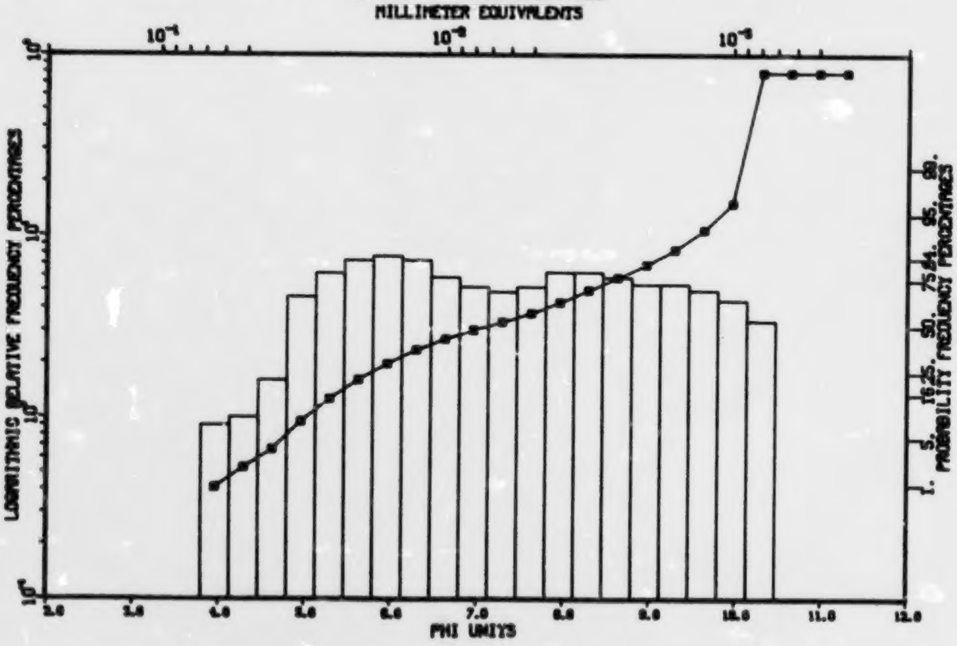
SAMPLE NO. - 930 J. SYVITSKI 8317583
CA-2.0 200 CAMBRIDGE FJORD

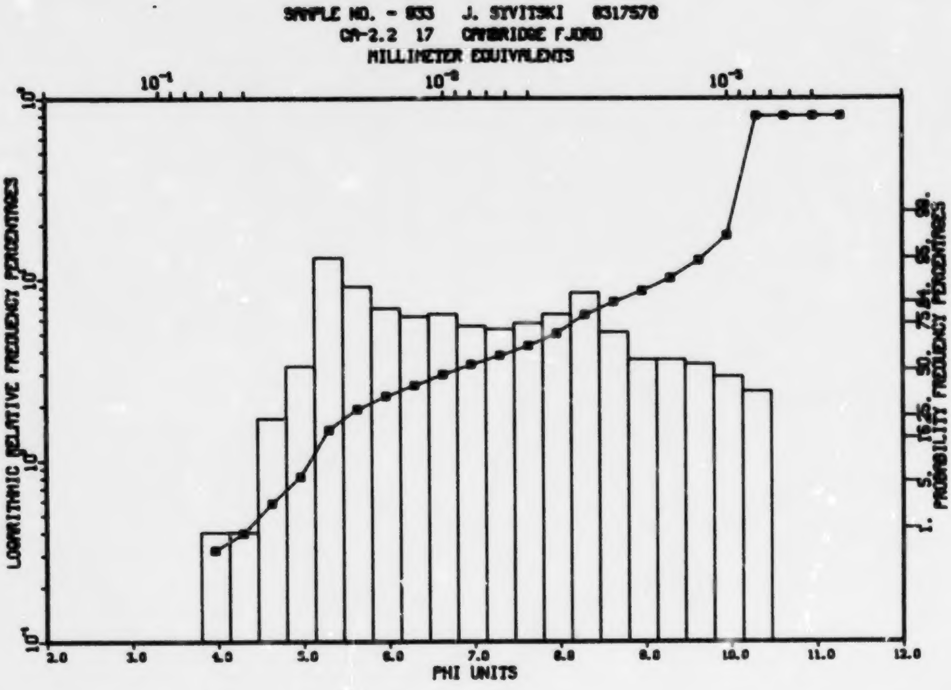


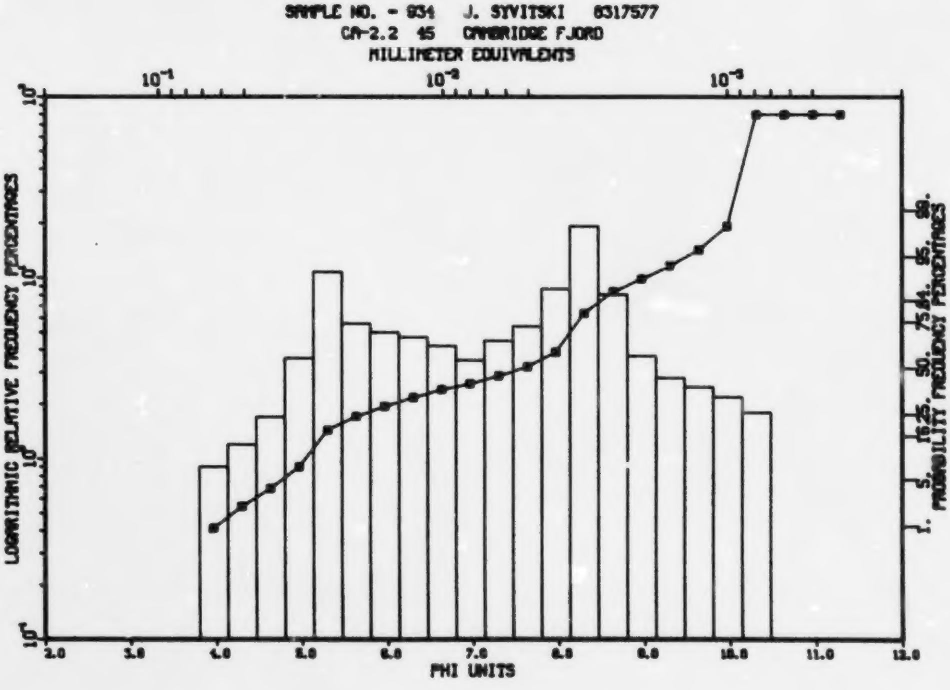
SAMPLE NO. - 831 J. SYVITSKI 8317582
CA-2.0 315 CAMBRIDGE FJORD



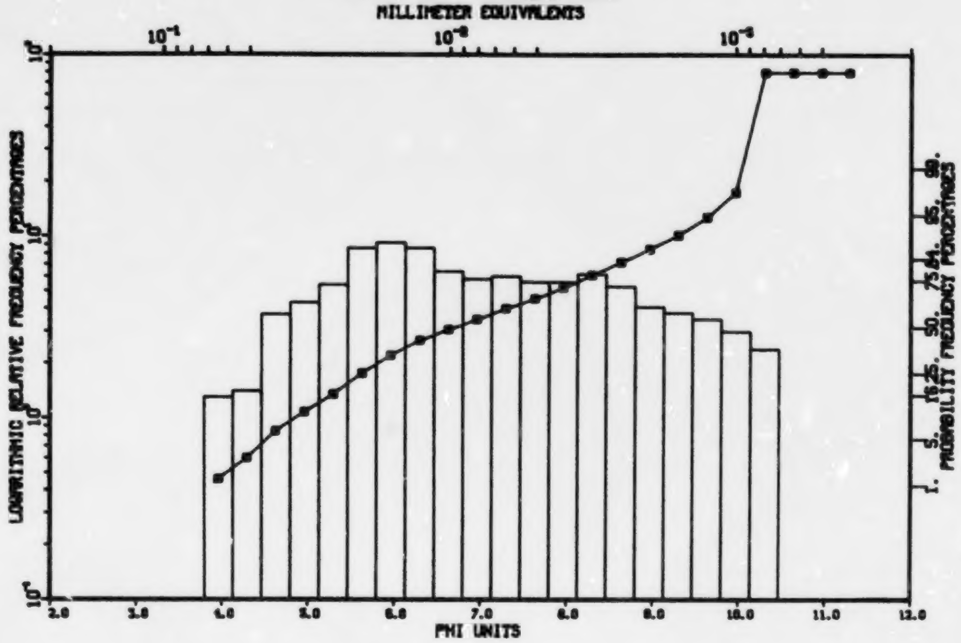
SAMPLE NO. - 832 J. SYVITSKI 8317581
CA-2.2 1 CAMBRIDGE FJORD



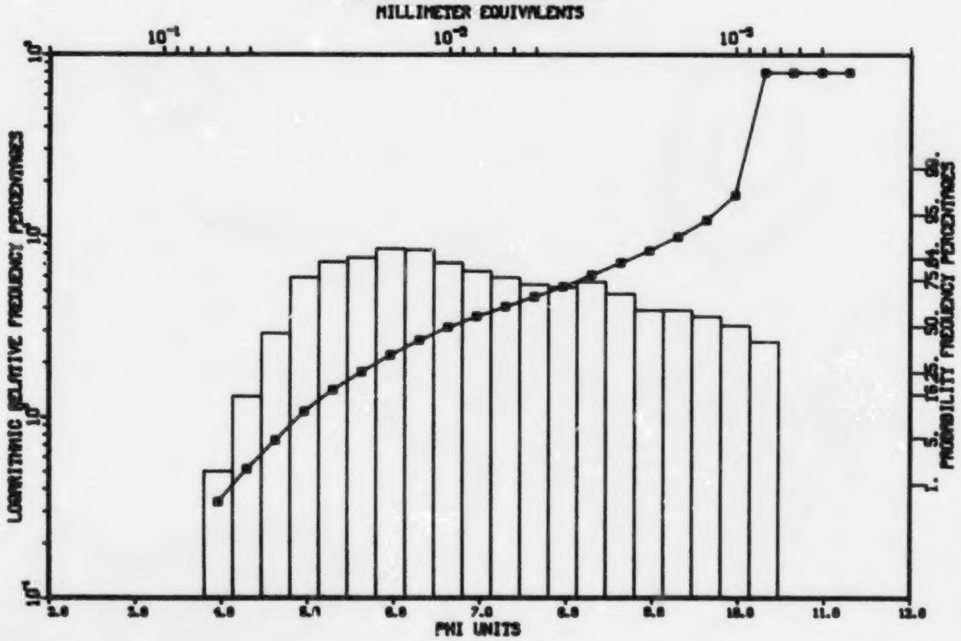

SAMPLE NO. - 933 J. SYVITSKI 8317578
CA-2.2 17 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
10^{2}
10^{1}
10^{0}
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS
1.
5.
16.25.
50.
75.84.
95.
99.
PROBABILITY FREQUENCY PERCENTAGES


SAMPLE NO. - 934 J. SYVITSKI 8317577
CA-2.2 45 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
10^{2}
10^{1}
10^{0}
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS
1.
5.
16.25.
50.
75.84.
95.
99.
PROBABILITY FREQUENCY PERCENTAGES

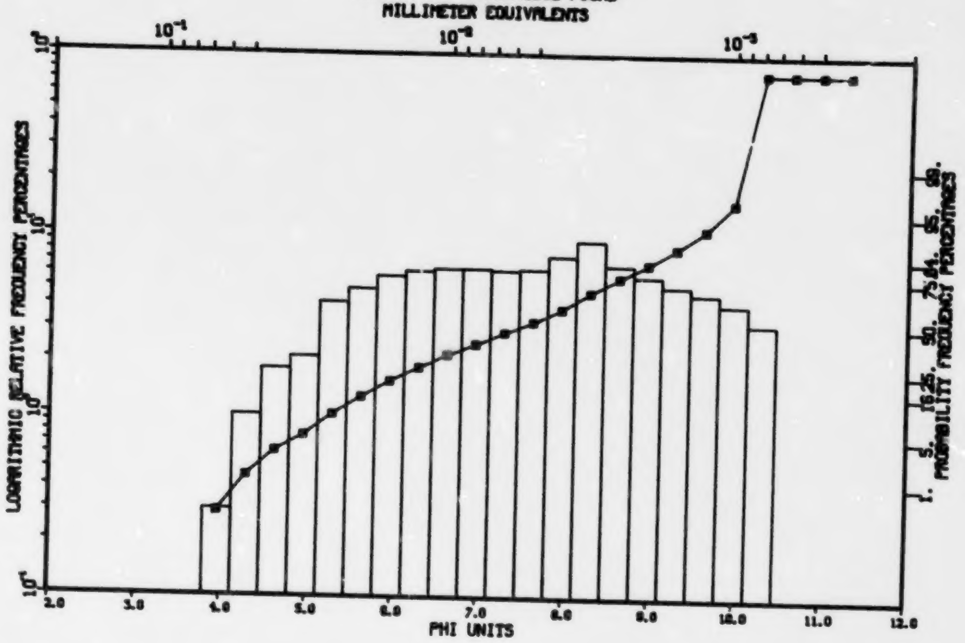
SAMPLE NO. - 935 J. SYVITSKI 8317574
CA-2.2 200 CAMBRIDGE FJORD



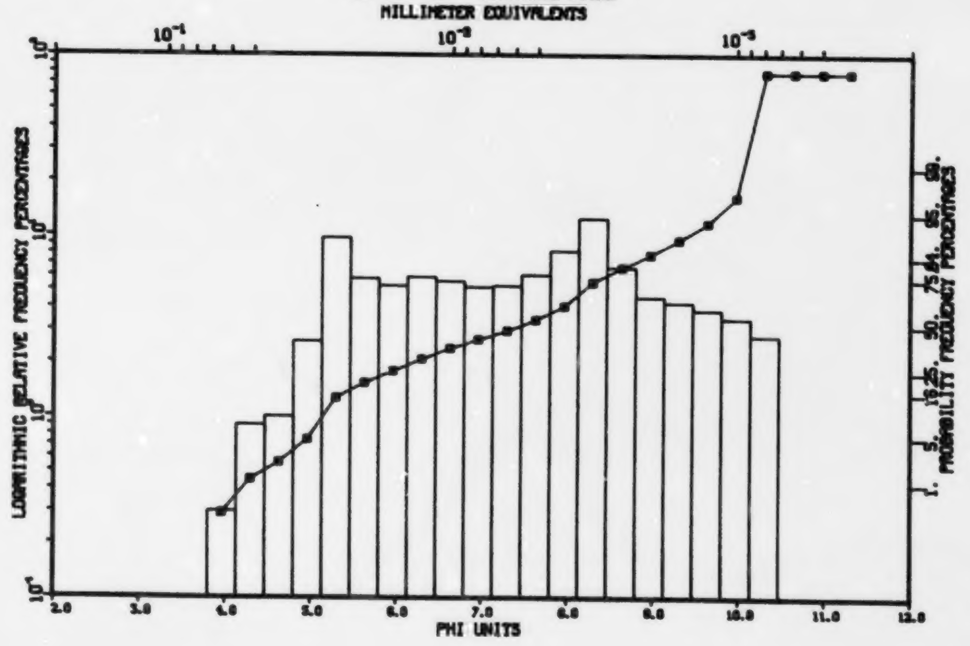
SAMPLE NO. - 936 J. SYVITSKI 8317572
CA-3.0 1 CAMBRIDGE FJORD

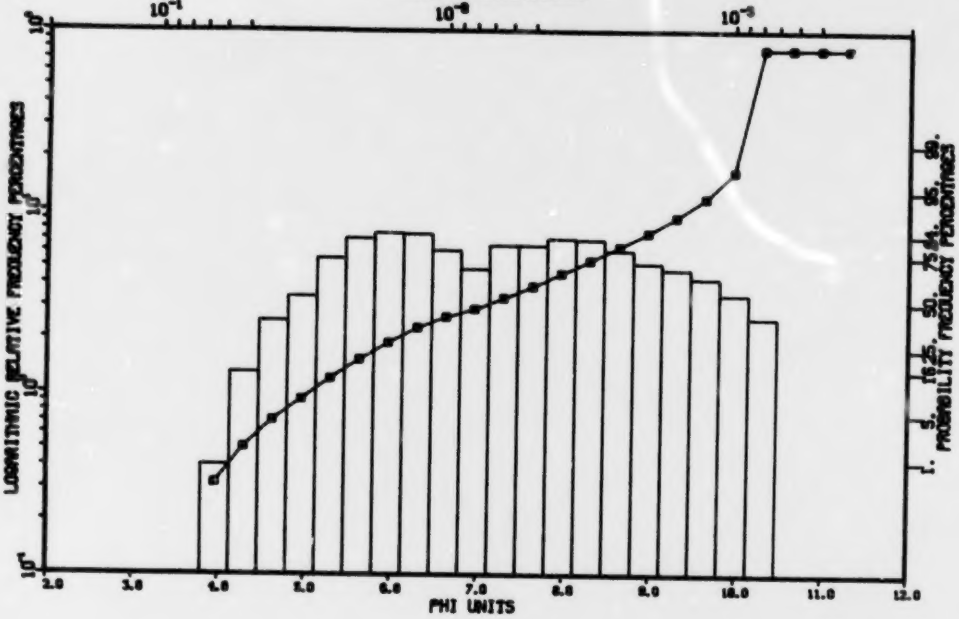


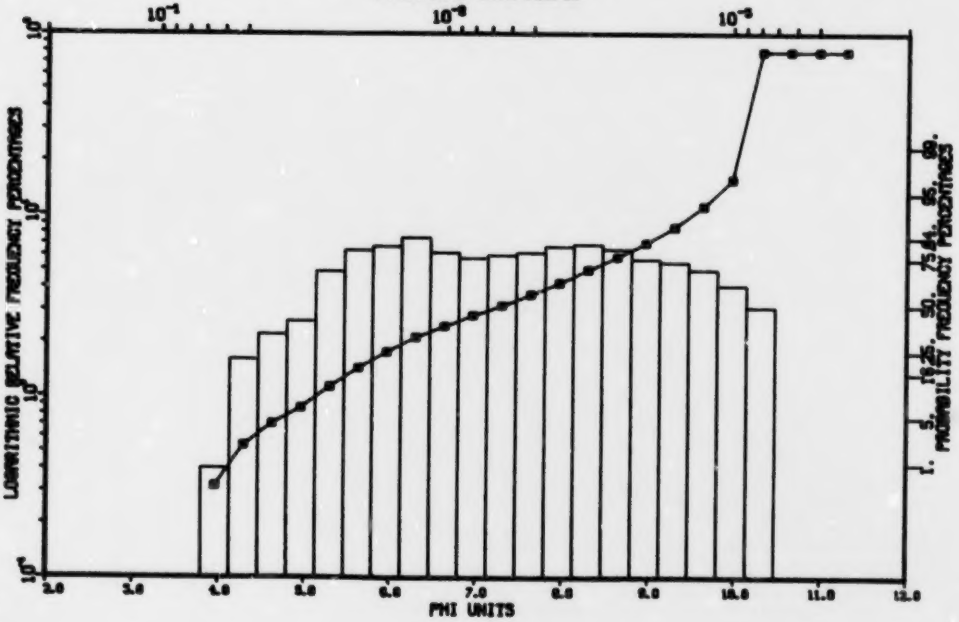
SAMPLE NO. - 937 J. SYVITSKI 8317570
CA-3.0 20 CAMBRIDGE FJORD



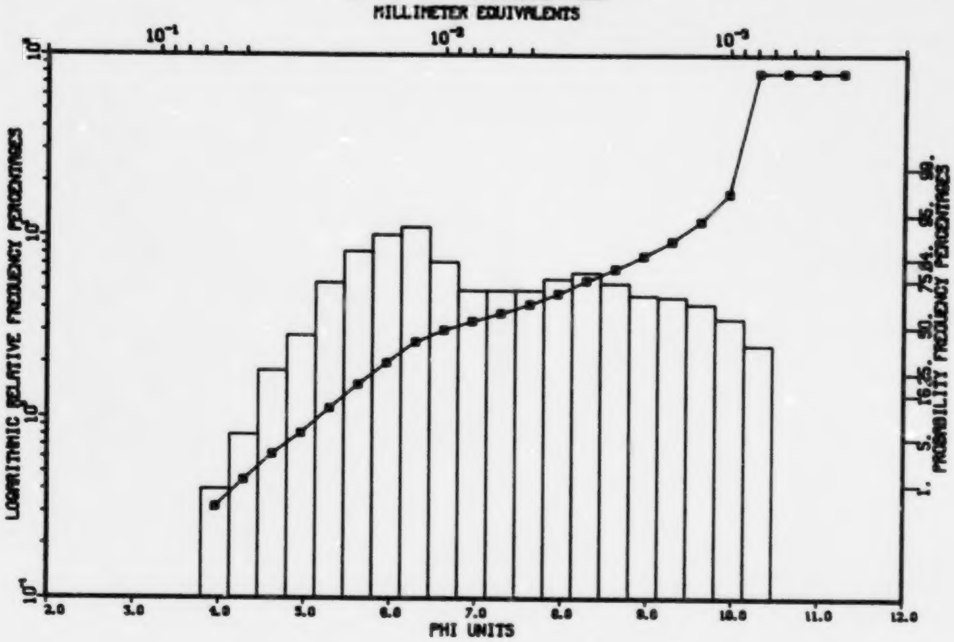
SAMPLE NO. - 938 J. SYVITSKI 8317569
CA-3.0 40 CAMBRIDGE FJORD



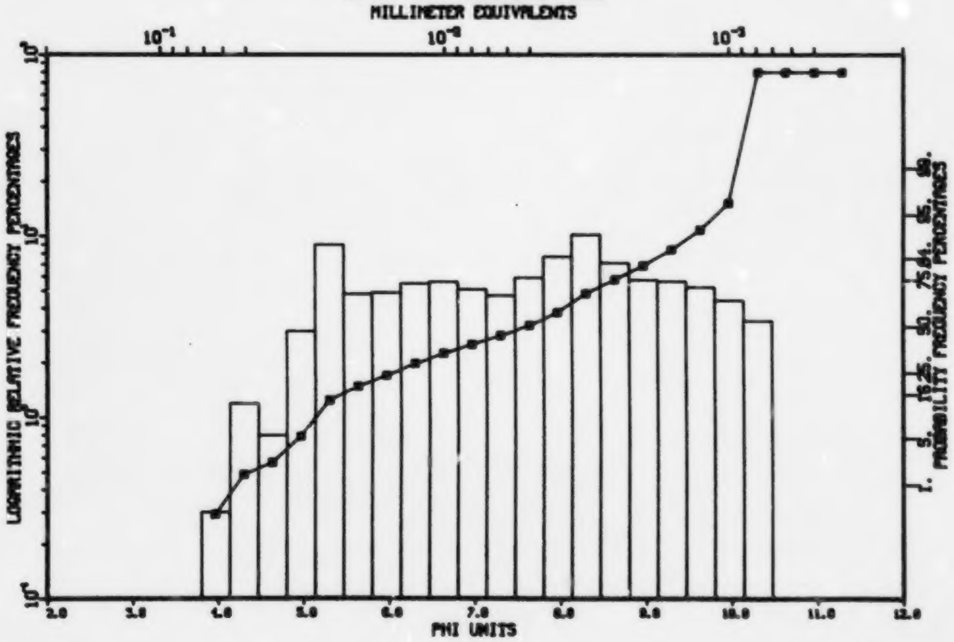

SAMPLE NO. - 939 J. SYVITSKI 8317565
CA-3.0 220 CAMBRIDGE FJORD


SAMPLE NO. - 940 J. SYVITSKI 8317564
CA-3.0 380 CAMBRIDGE FJORD

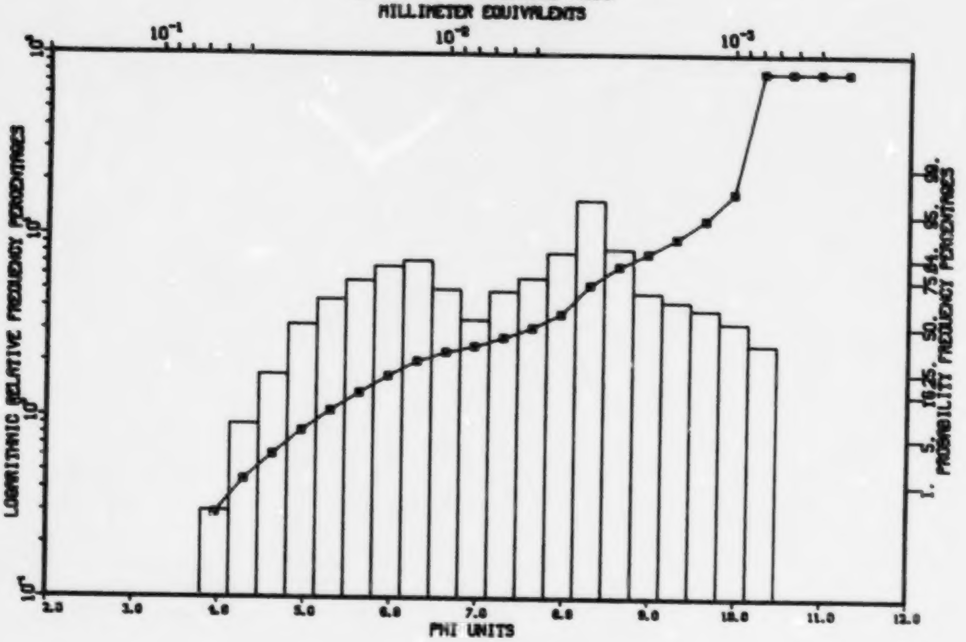
SAMPLE NO. - 941 J. SYVITSKI 8317534
CA-4.1 10 CAMBRIDGE FJORD



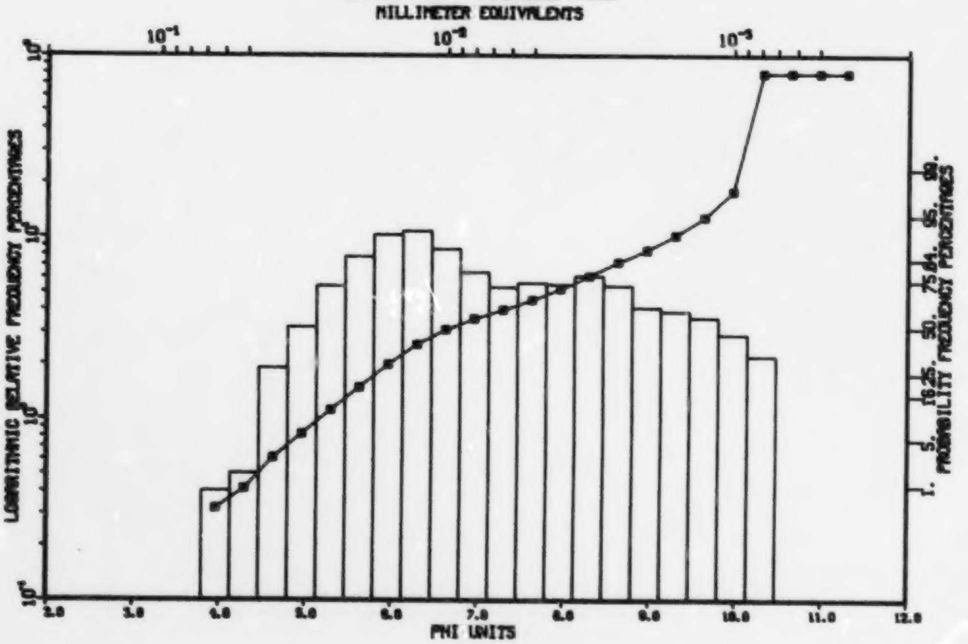
SAMPLE NO. - 942 J. SYVISTKI 8317532
CA-4.1 30 CAMBRIDGE FJORD



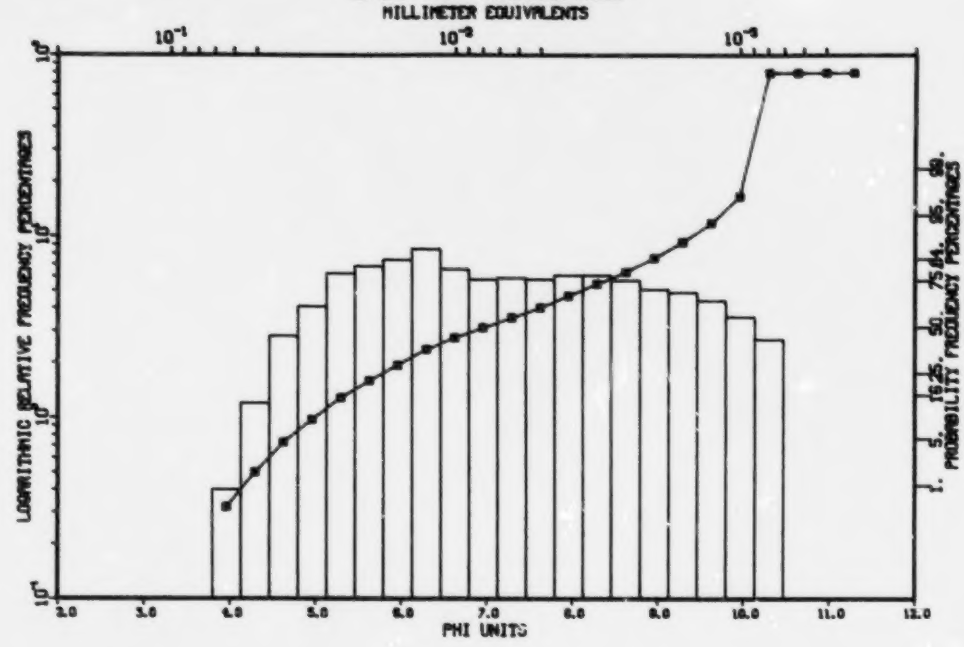
SAMPLE NO. - 943 J. SYVITSKI 8317531
CA-4.1 45 CAMBRIDGE FJORD



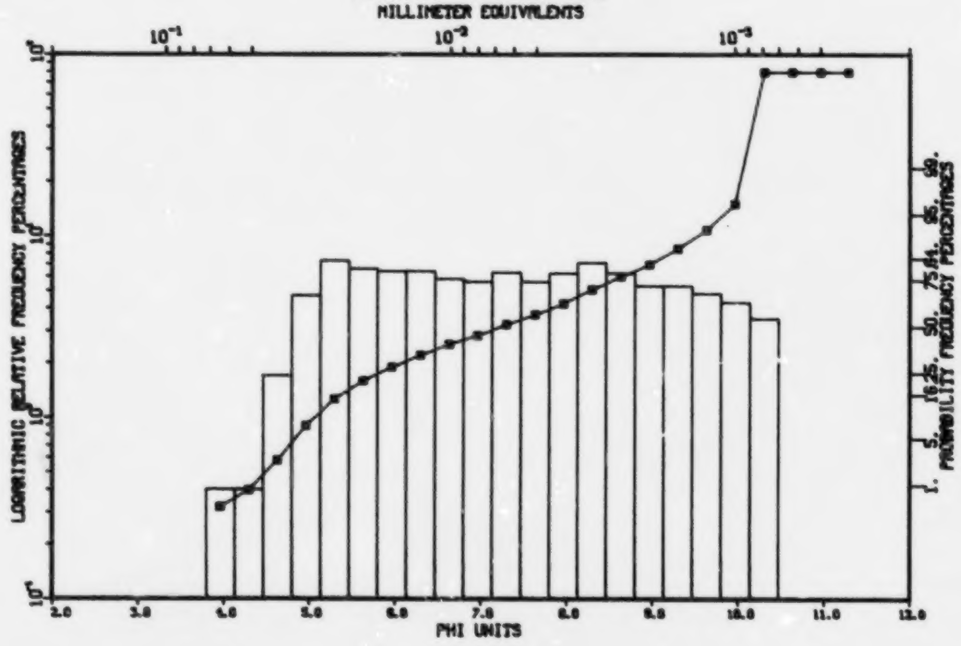
SAMPLE NO. - 944 J. SYVITSKI 8317530
CA-4.1 100 CAMBRIDGE FJORD



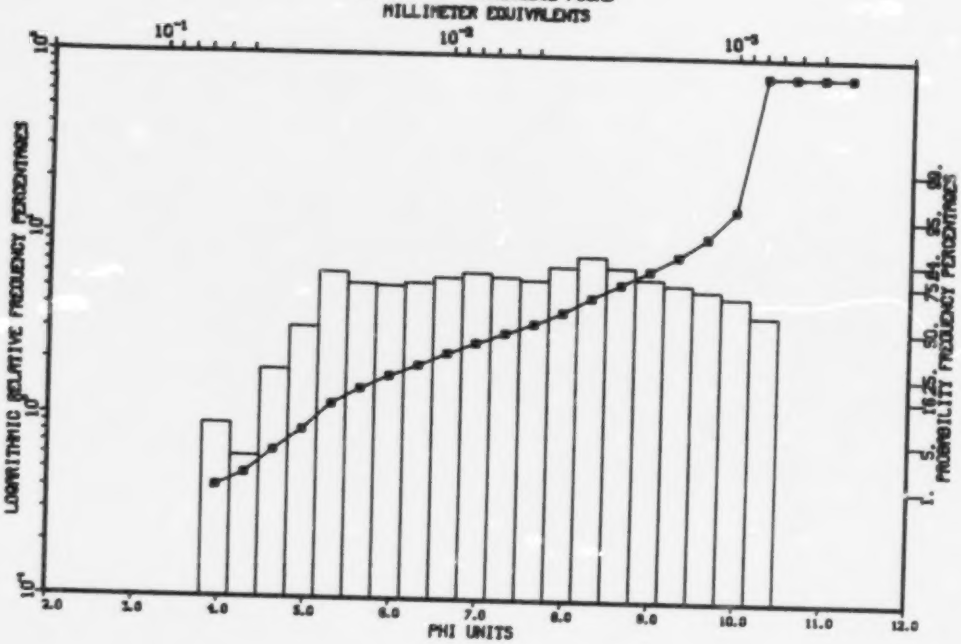
SAMPLE NO. - 945 J. SYVITSKI 8317528
CA-4.1 500 CAMBRIDGE FJORD



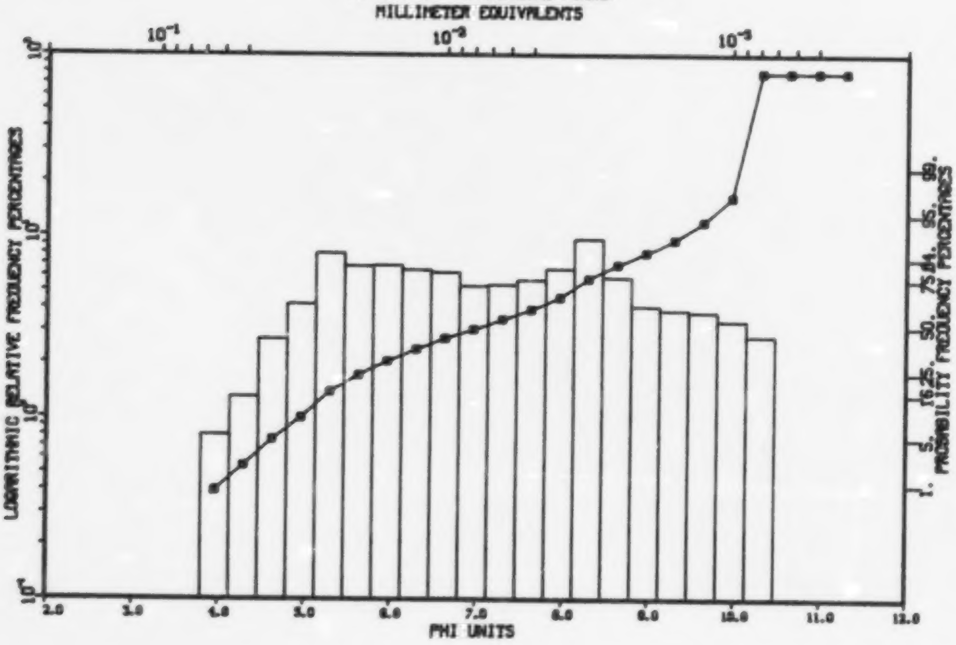
SAMPLE NO. - 946 J. SYVITSKI 8317527
CA-4.2 1 CAMBRIDGE FJORD

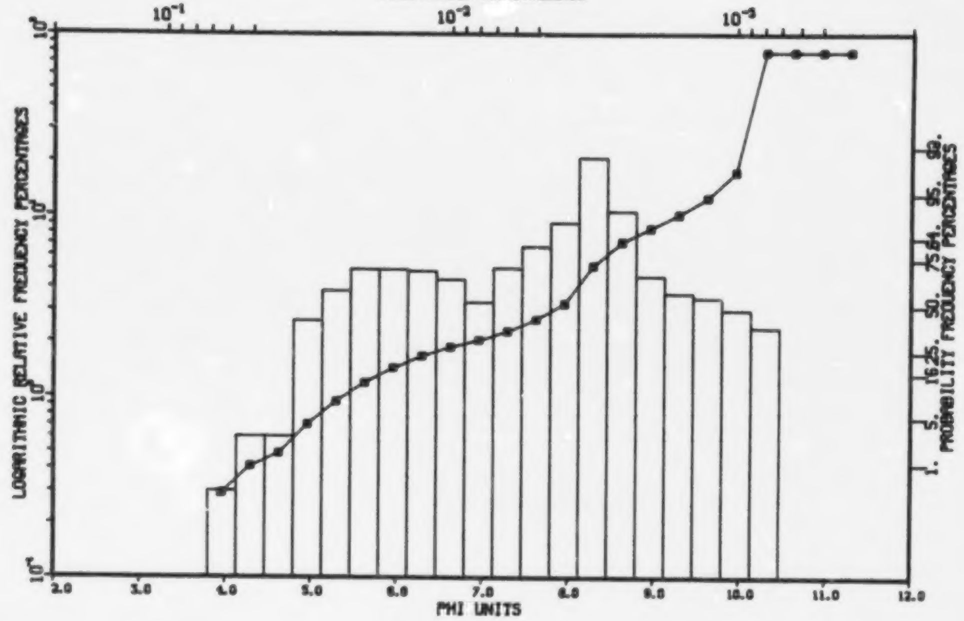


SAMPLE NO. - 947 J. SYVITSKI 8317526
CA-4.2 5 CAMBRIDGE FJORD

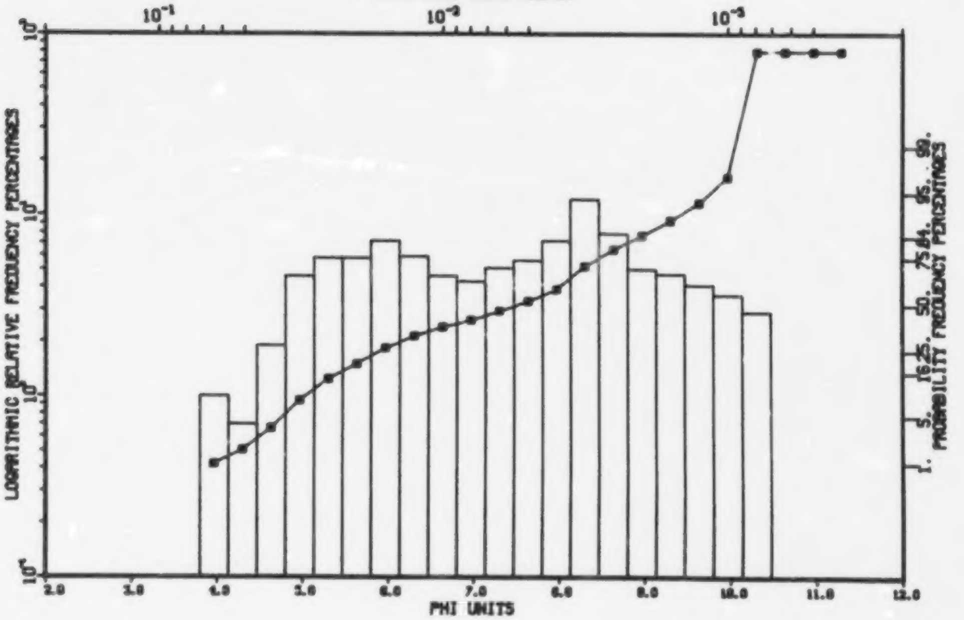


SAMPLE NO. - 948 J. SYVITSKI 8317524
CA-4.2 25 CAMBRIDGE FJORD



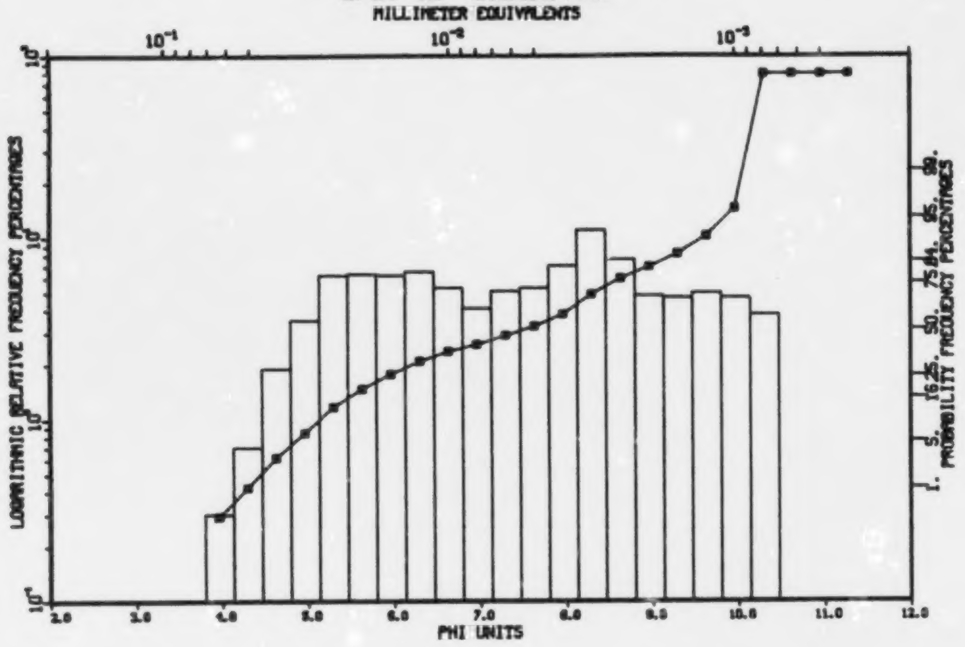


SAMPLE NO. - 949 J. SYVITSKI 8317523
CA-4.2 45 CAMBRIDGE FJORD

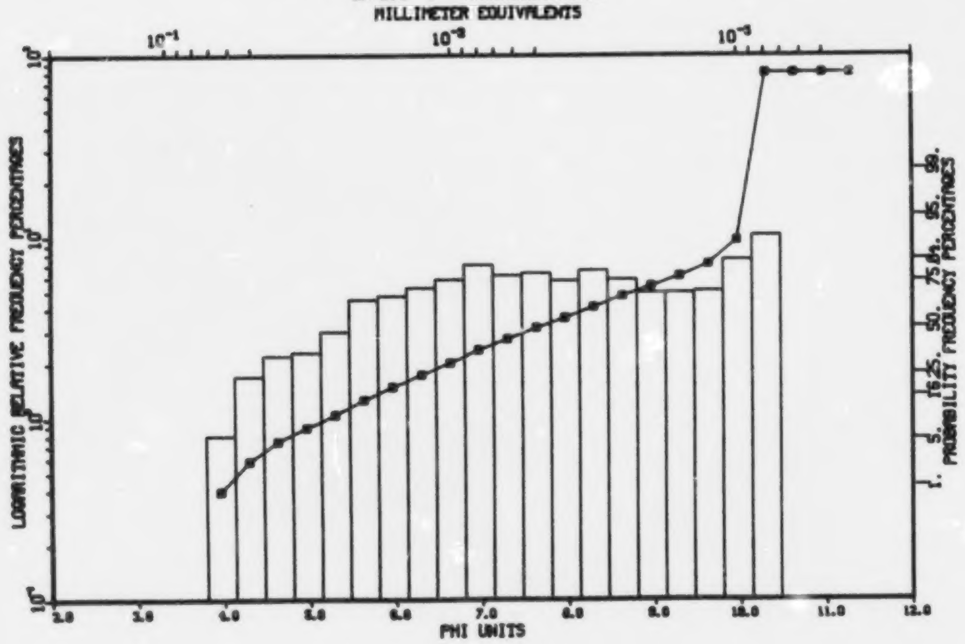


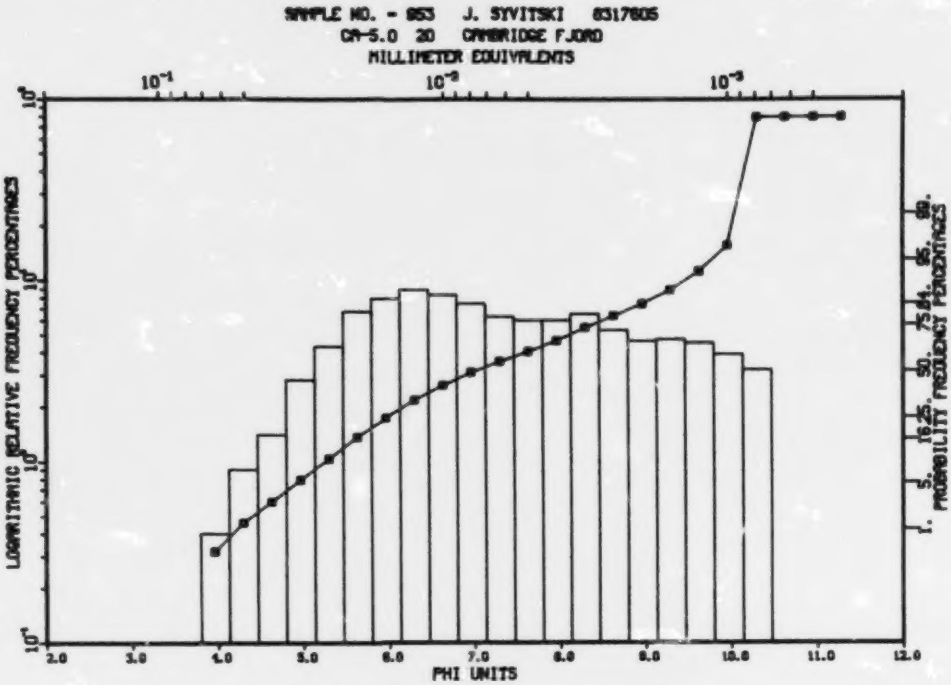
SAMPLE NO. - 950 J. SYVITSKI 8317522
CA-4.2 80 CAMBRIDGE FJORD

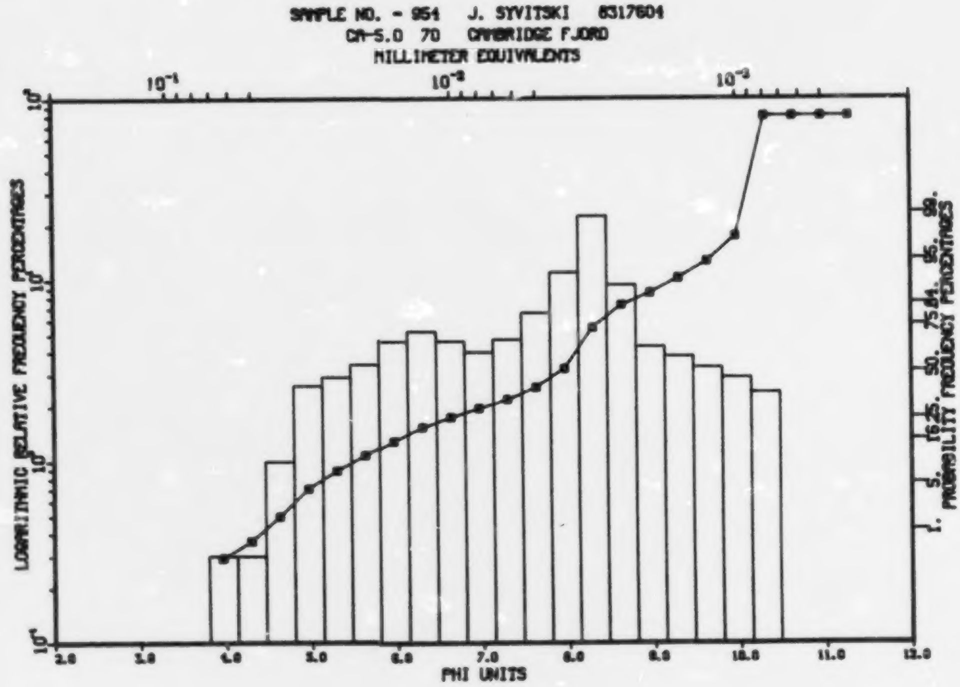
SAMPLE NO. - 951 J. SYVITSKI 8317521
CA-4.2 105 CAMBRIDGE FJORD



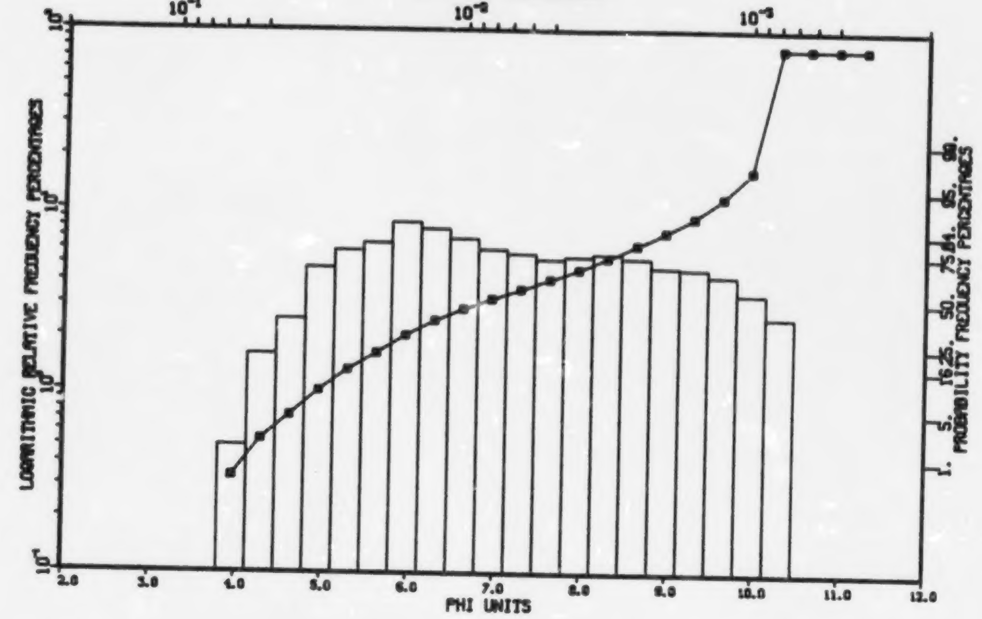
SAMPLE NO. - 952 J. SYVITSKI 8317608
CA-5.0 1 CAMBRIDGE FJORD



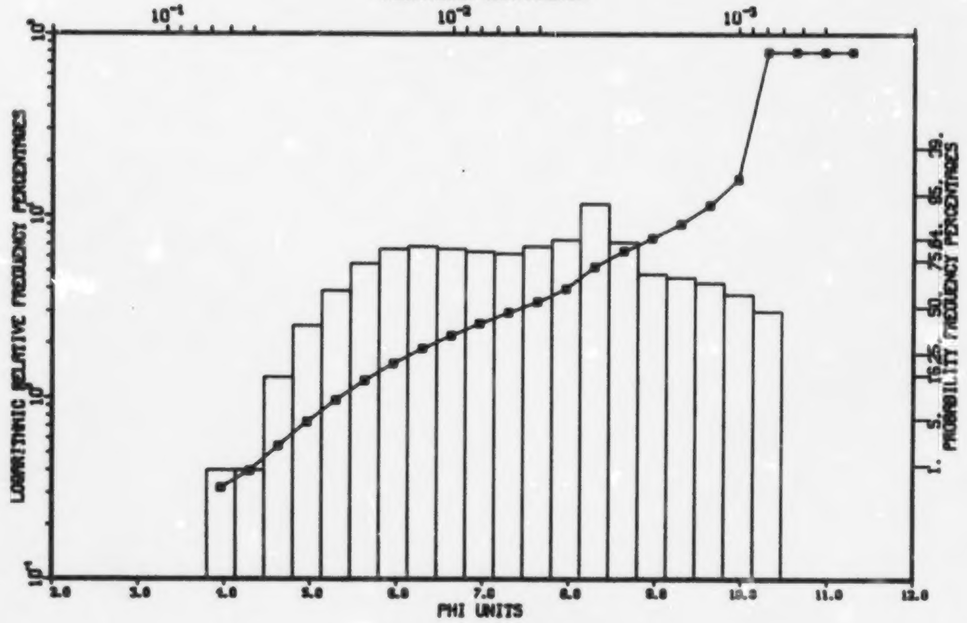

SAMPLE NO. - 953 J. SYVITSKI 8317605
CA-5.0 20 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
10^{2}
10^{1}
10^{0}
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
PROBABILITY FREQUENCY PERCENTAGES
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


SAMPLE NO. - 954 J. SYVITSKI 8317604
CA-5.0 70 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
10^{2}
10^{1}
10^{0}
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
PROBABILITY FREQUENCY PERCENTAGES
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

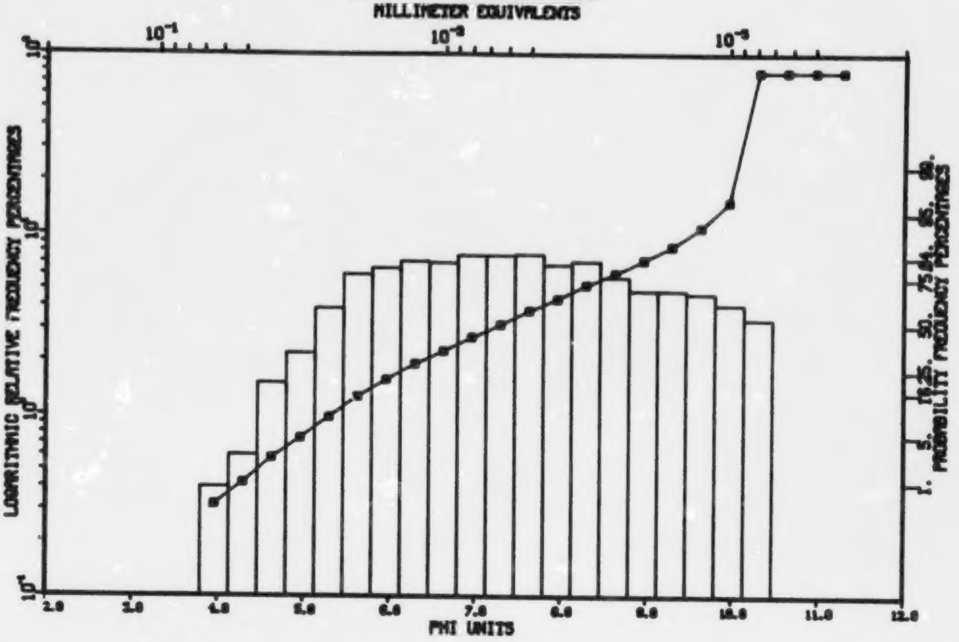
SAMPLE NO. - 956 J. SYVITSKI 8317601
CA-5.0 500 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



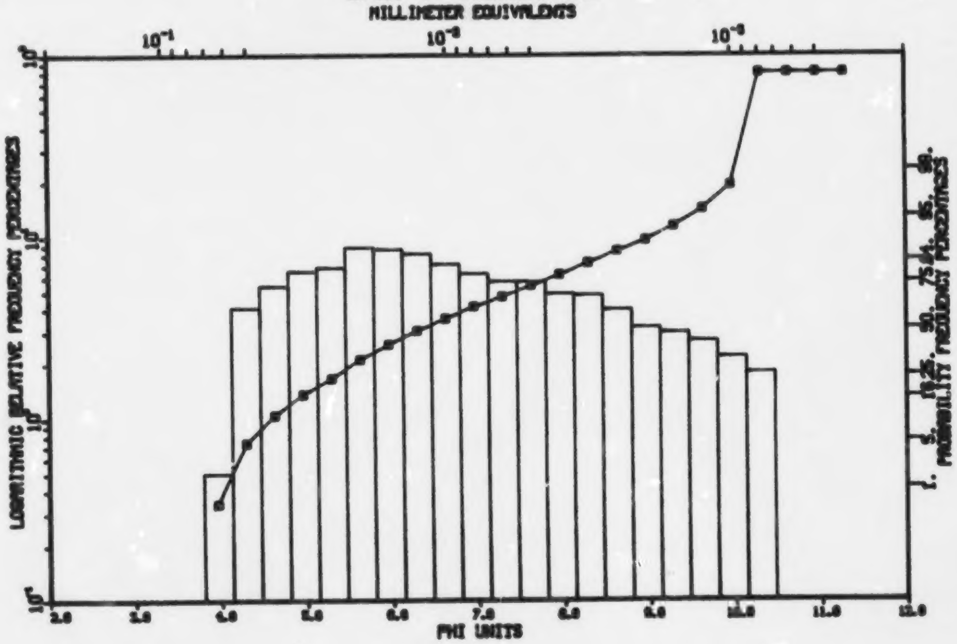
SAMPLE NO. - 956 J. SYVITSKI 8317600
CA-5.0 580 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS

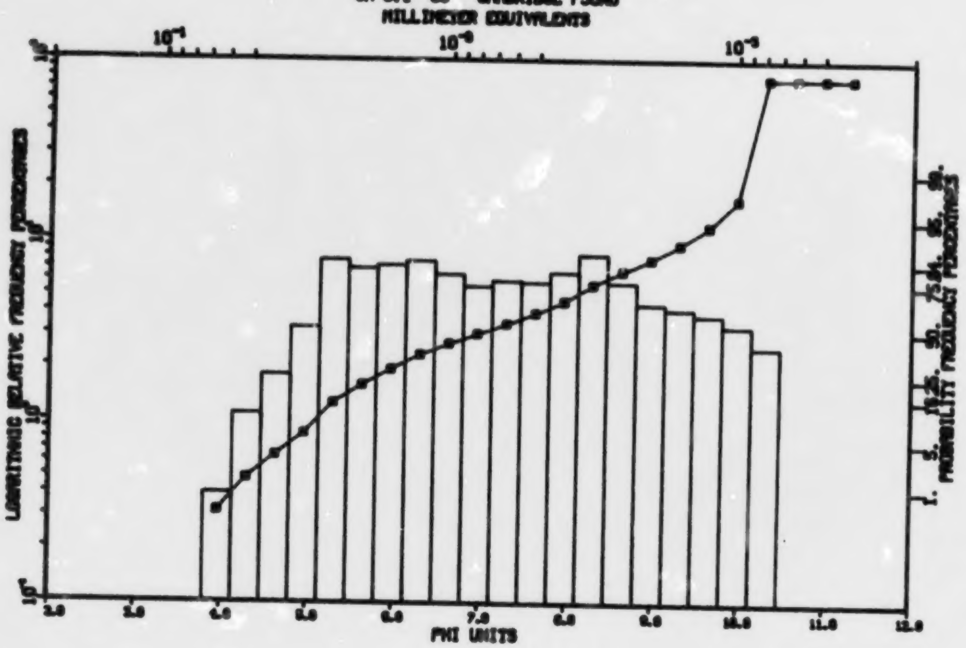


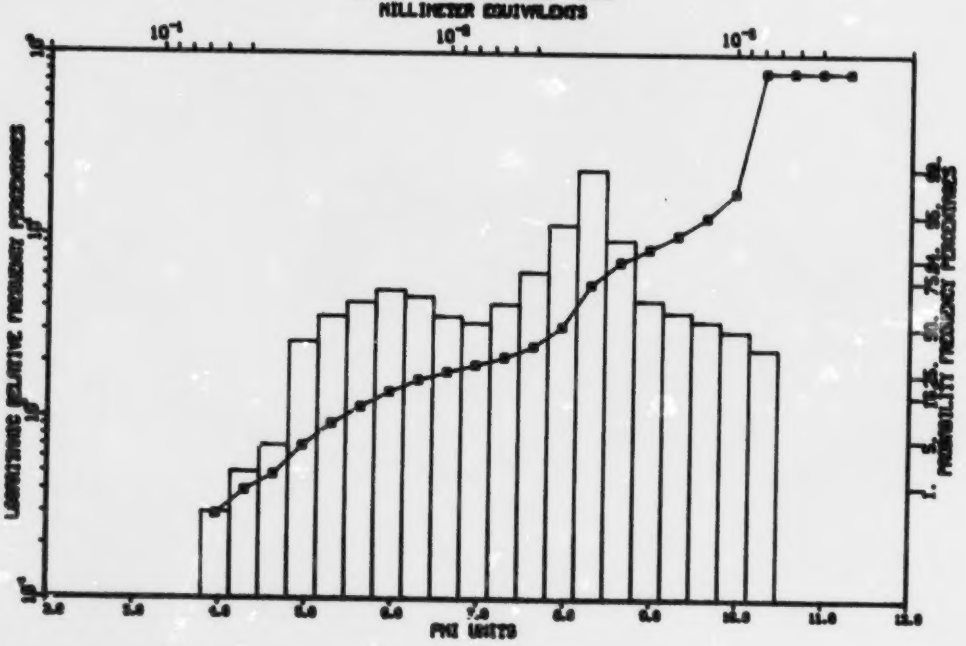
SAMPLE NO. - 957 J. SYVITSKI 8317817
CA-5.1 1 CAMBRIDGE FJORD

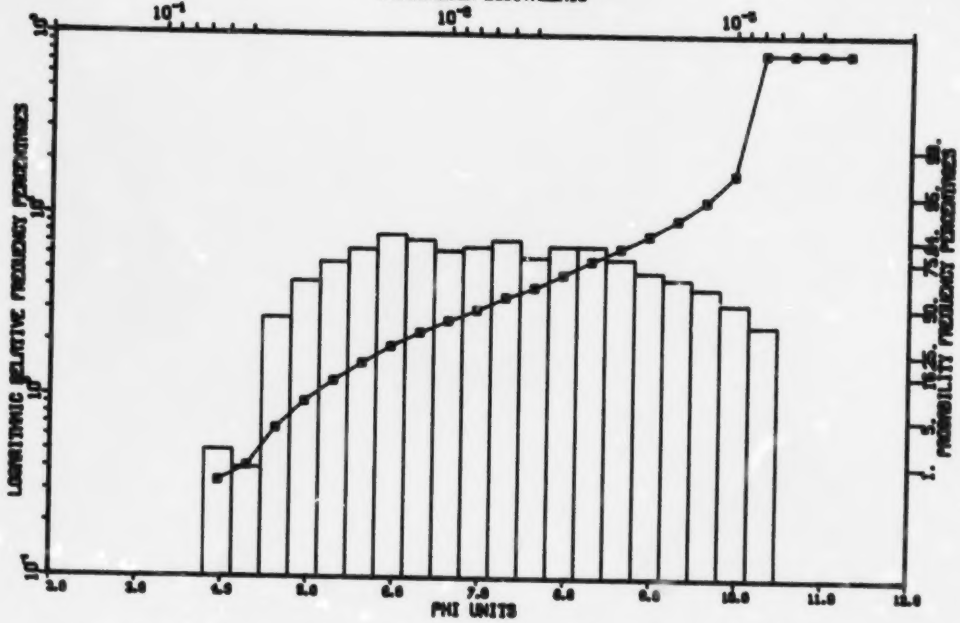


SAMPLE NO. - 958 J. SYVITSKI 8317816
CA-5.1 5 CAMBRIDGE FJORD

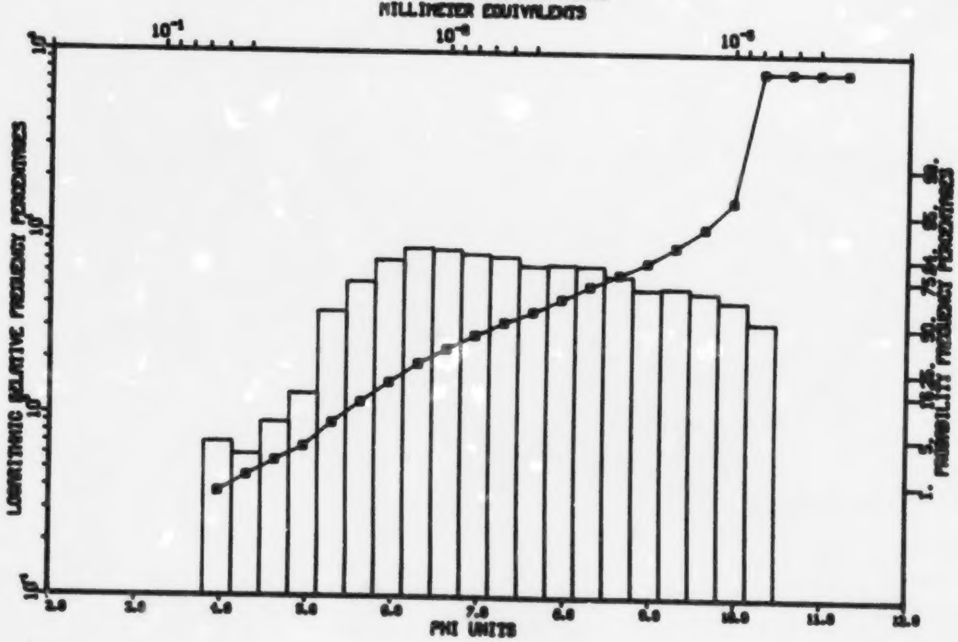



SAMPLE NO. - 880 J. SYVITSKI 8317814
CA-S.1 30 CAMBRIDGE FJORD


SAMPLE NO. - 880 J. SYVITSKI 8317812
CA-S.1 70 CAMBRIDGE FJORD

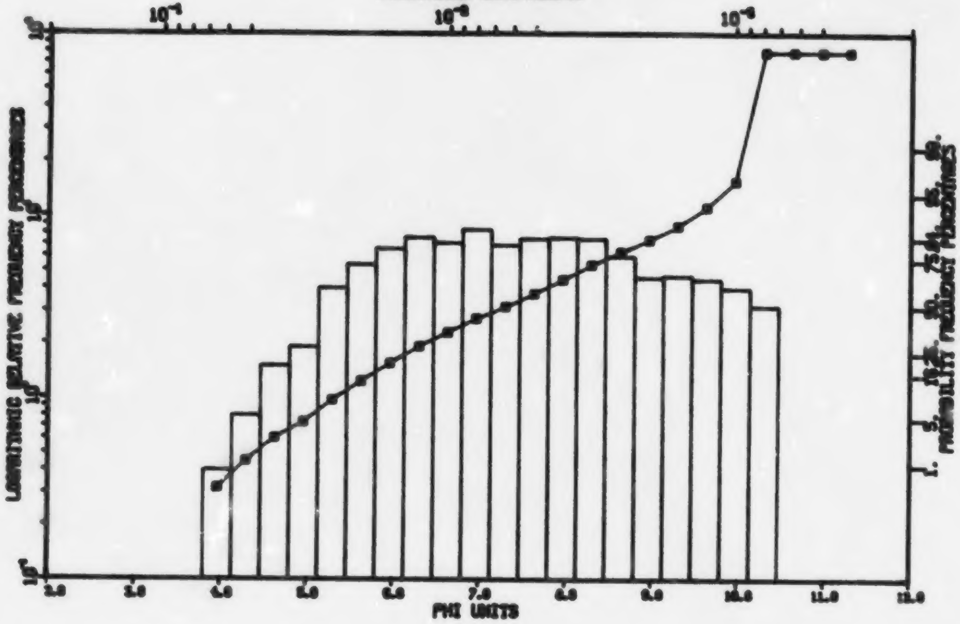


SAMPLE NO. - 001 J. SYVITSKI 8317808
CR-5.1 480 CAMBRIDGE FJORD

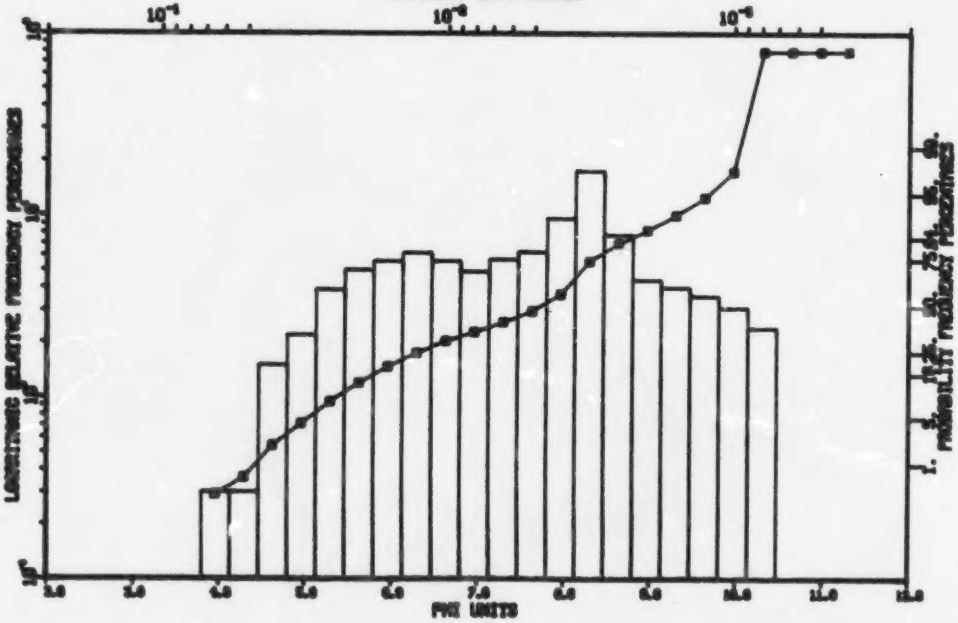


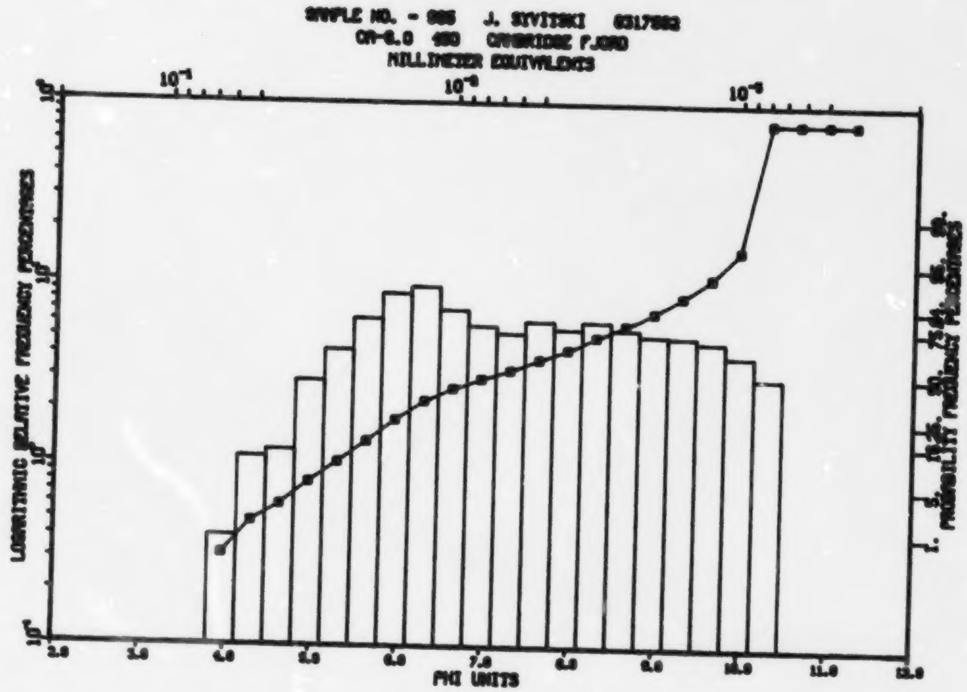
SAMPLE NO. - 002 J. SYVITSKI 8317588
CR-6.0 1 CAMBRIDGE FJORD

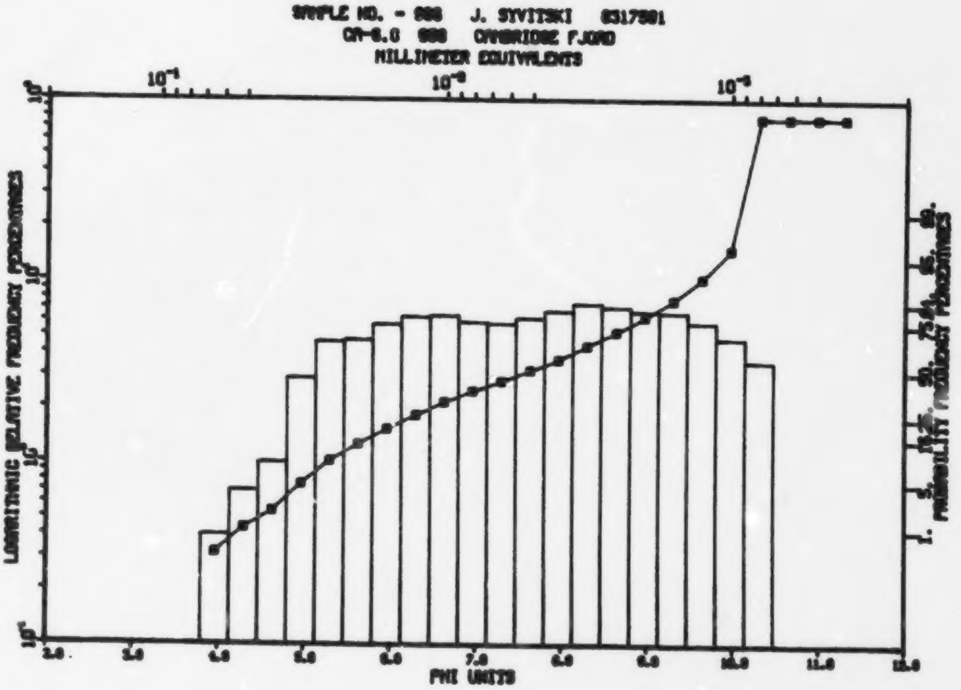
SAMPLE NO. - 003 J. SYVITSKI 8317086
CA-6.0 20 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS

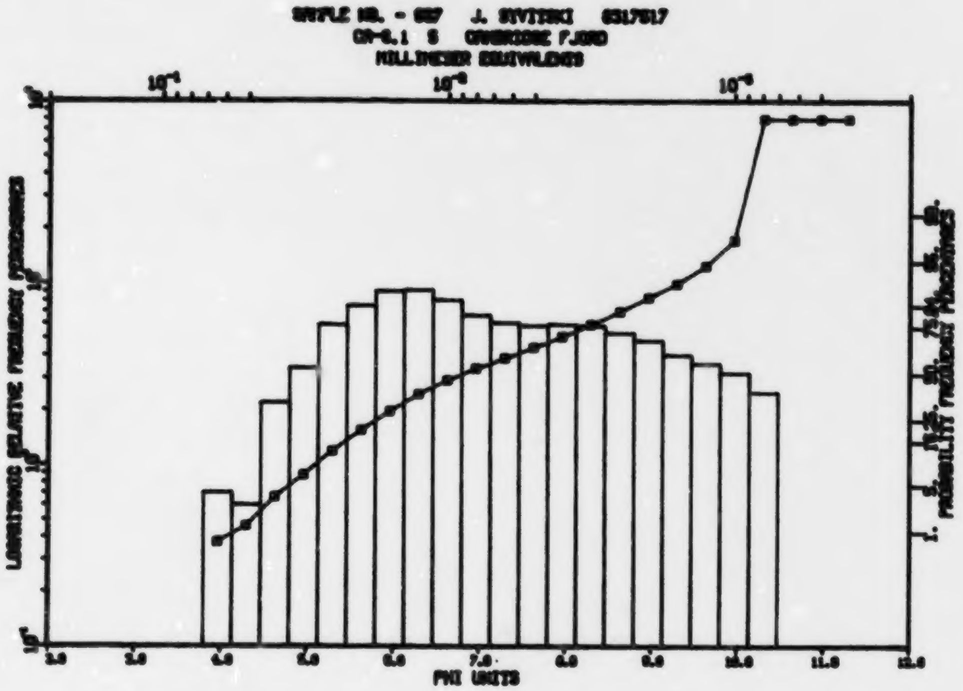


SAMPLE NO. - 004 J. SYVITSKI 8317085
CA-6.0 80 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS




SAMPLE NO. - 986 J. SYVITSKI 8317982
CA-6.0 480 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{2}
10^{1}
10^{0}
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
15.
25.
50.
75.
84.
95.
99.
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


SAMPLE NO. - 988 J. SYVITSKI 8317981
CA-6.0 988 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{2}
10^{1}
10^{0}
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
15.
25.
50.
75.
84.
95.
99.
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


SAMPLE NO. - 007 J. SYVITSKI 8317617
CR-6.1 S CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
15.
25.
50.
75.
85.
95.
99.
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
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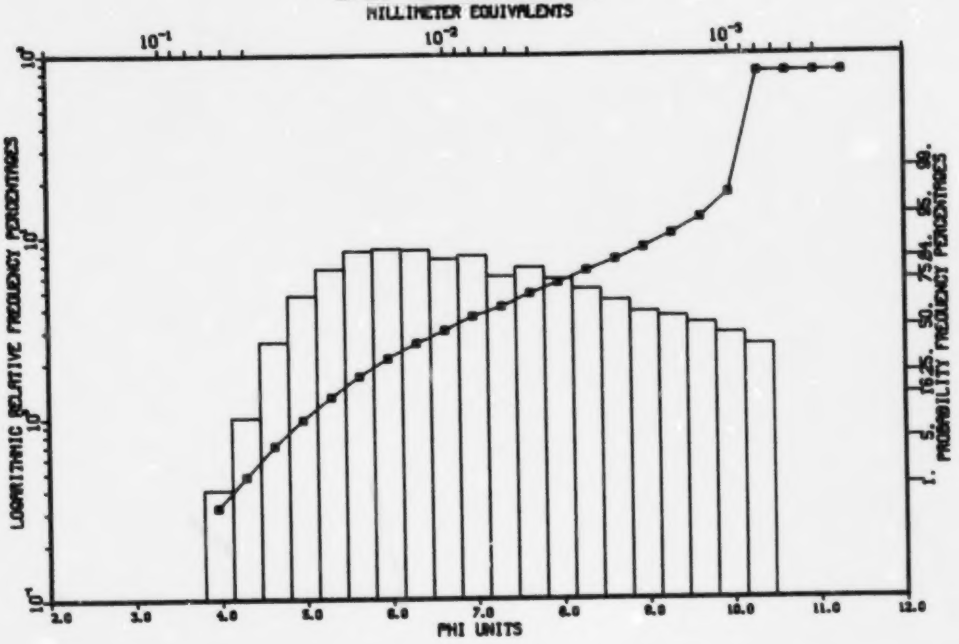
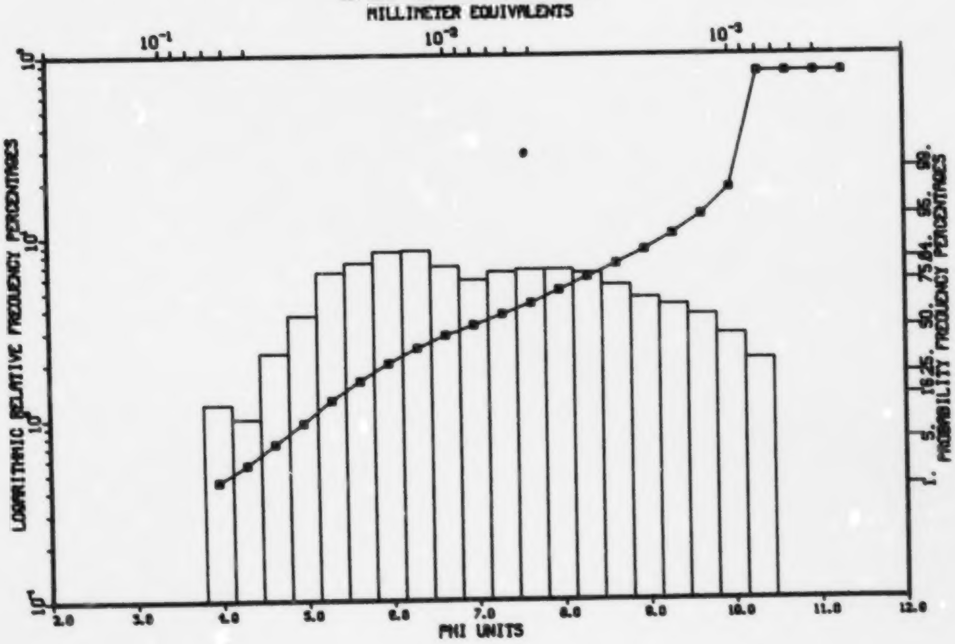
11.0
12.0
PHI UNITS

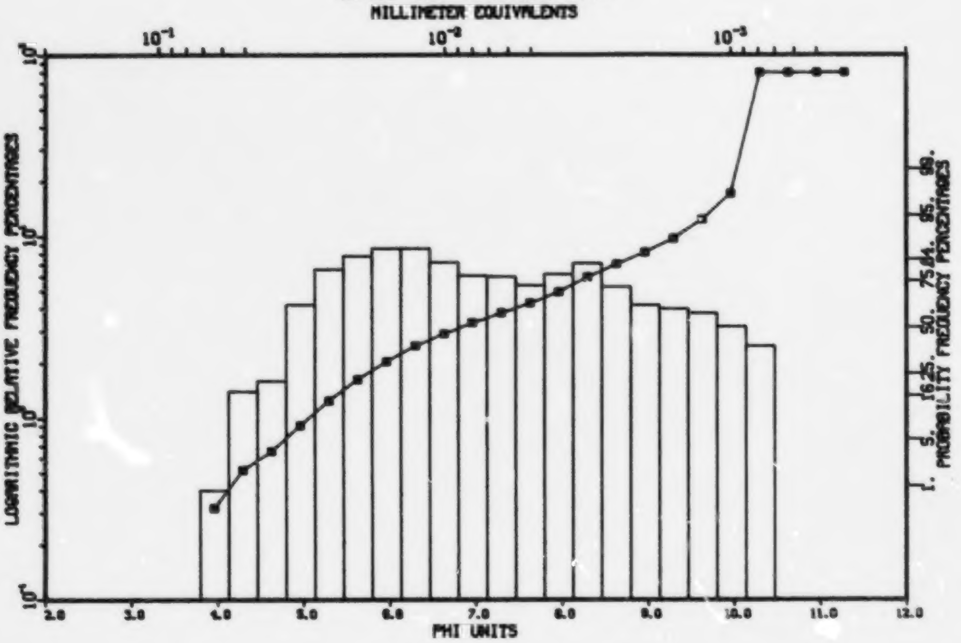
SAMPLE NO. - 988 J. SYVITSKI 8317516
CA-6.1 10 CAMBRIDGE FJORD



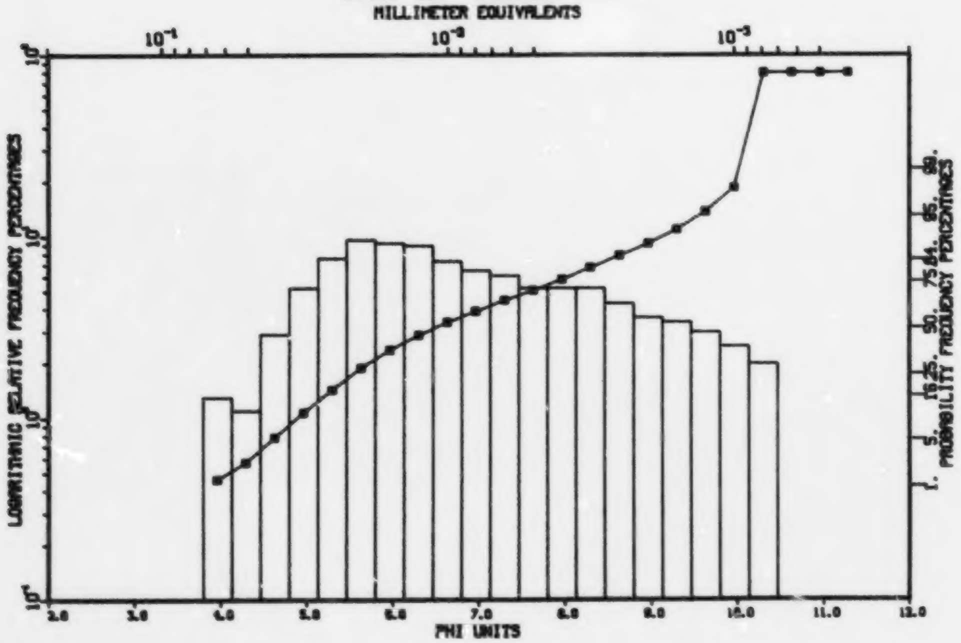
SAMPLE NO. - 989 J. SYVITSKI 8317515
CA-6.1 20 CAMBRIDGE FJORD



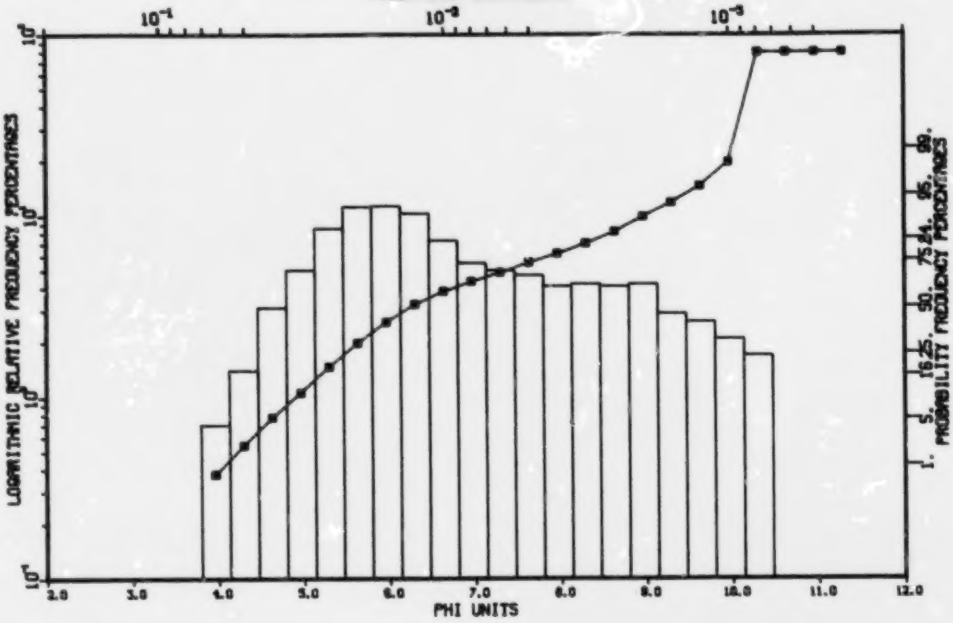
SAMPLE NO. - 970 J. SYVITSKI 8317513
CA-6.1 150 CAMBRIDGE FJORD



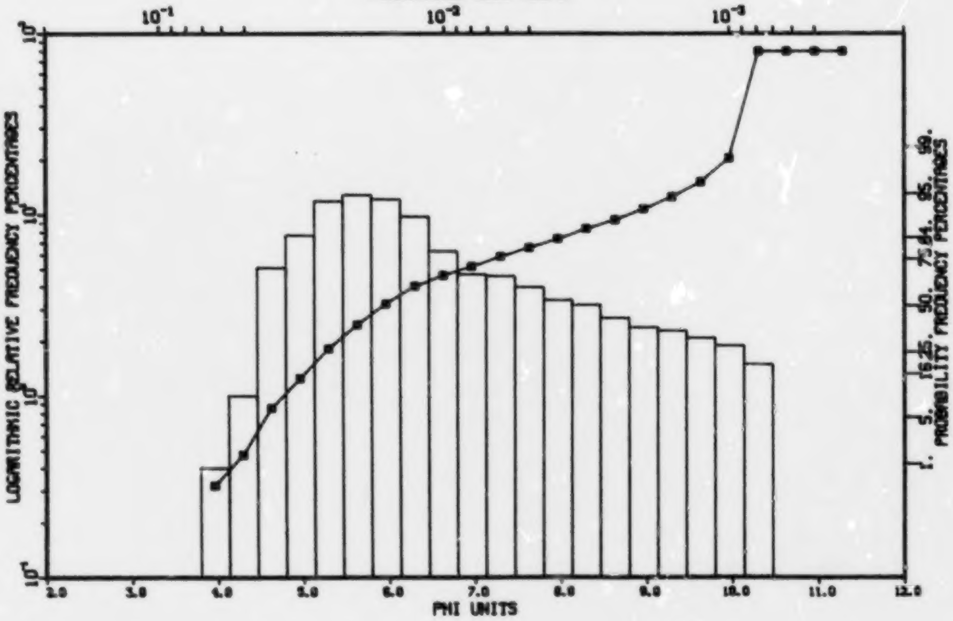
SAMPLE NO. - 971 J. SYVITSKI 8317512
CA-6.1 200 CAMBRIDGE FJORD



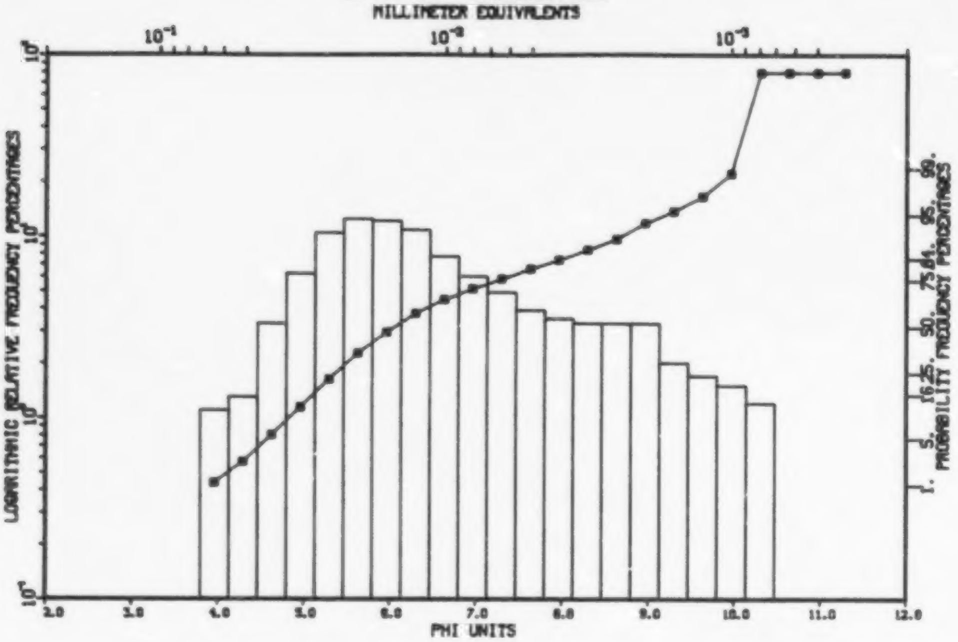
SAMPLE NO. - 972 J. SYVITSKI 8317508
CA-7.1 1 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



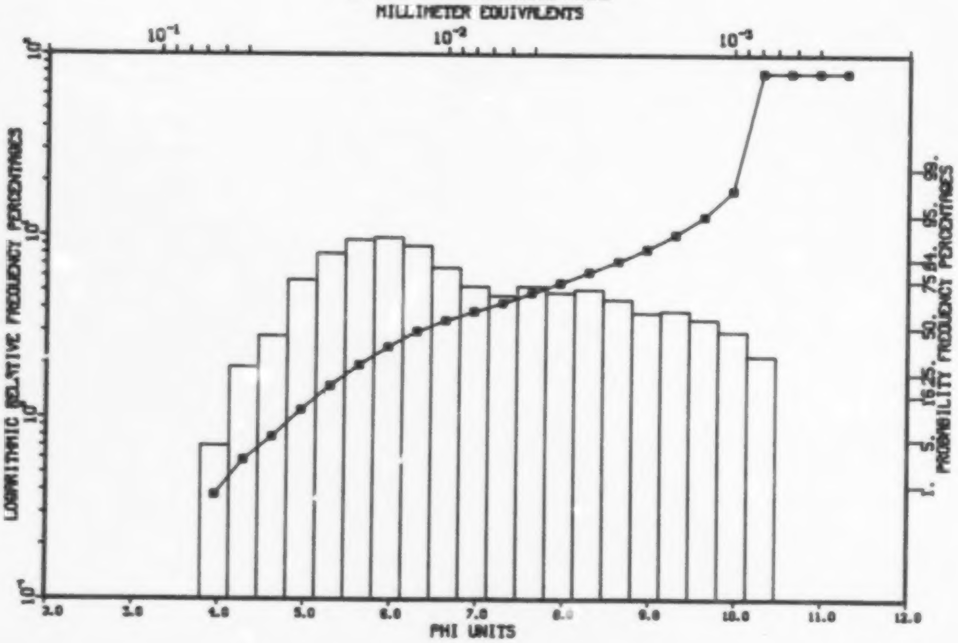
SAMPLE NO. - 973 J. SYVITSKI 8317508
CA-7.1 5 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



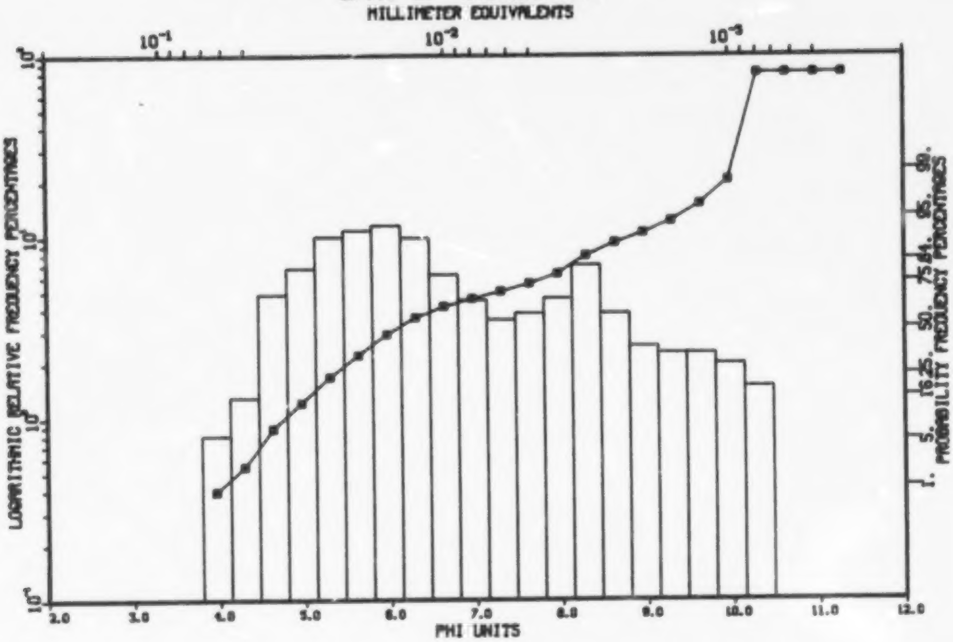
SAMPLE NO. - 974   J. SYVITSKI   8317507
CA-7.1 10   CAMBRIDGE FJORD



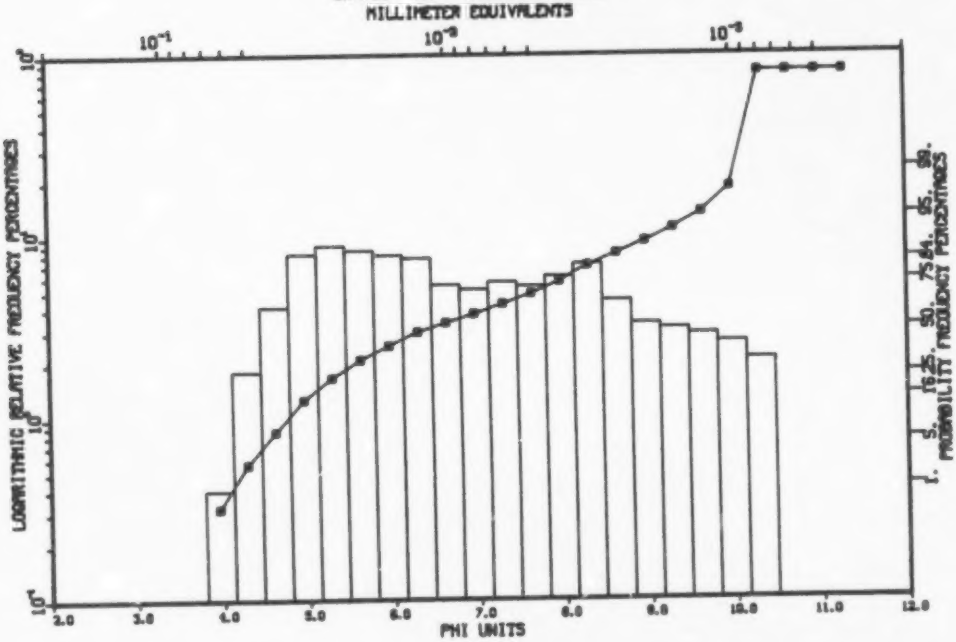
SAMPLE NO. - 975   J. SYVITSKI   8317506
CA-7.1 20   CAMBRIDGE FJORD



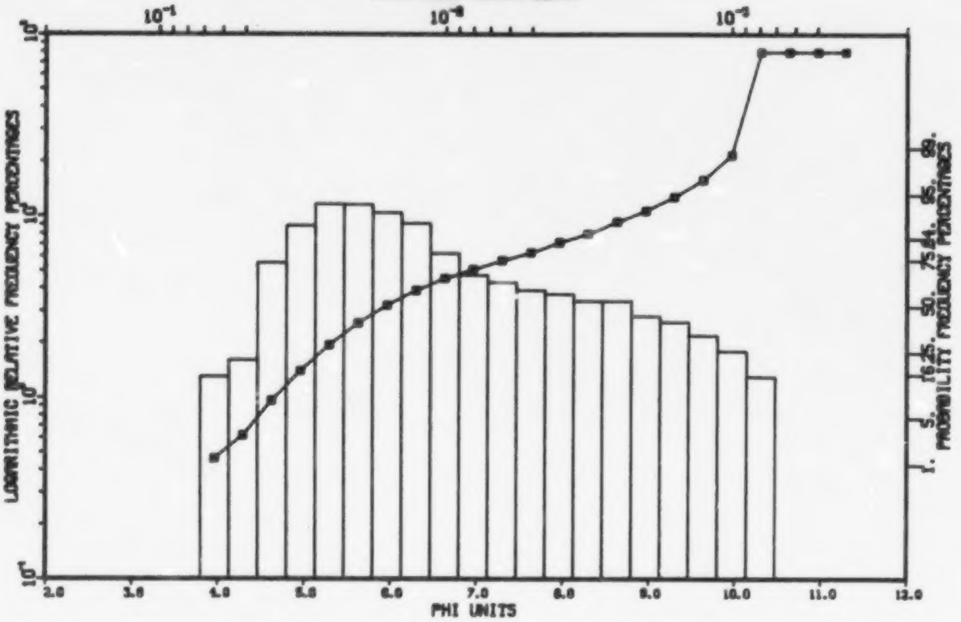
SAMPLE NO. - 976 J. SYVITSKI 8317505
CA-7.1 51 CAMBRIDGE FJORD



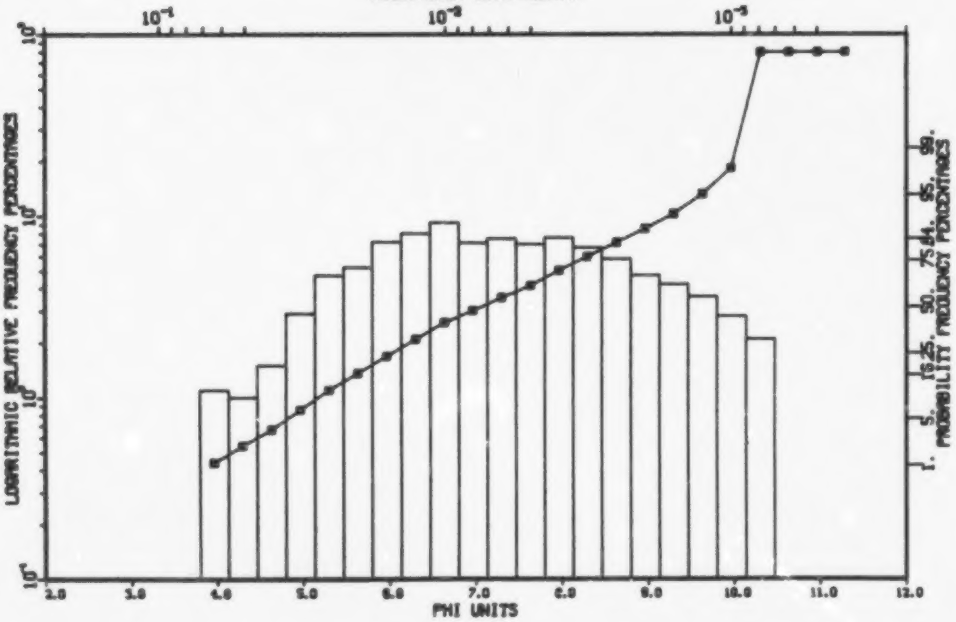
SAMPLE NO. - 977 J. SYVITSKI 8317503
CA-7.1 102 CAMBRIDGE FJORD



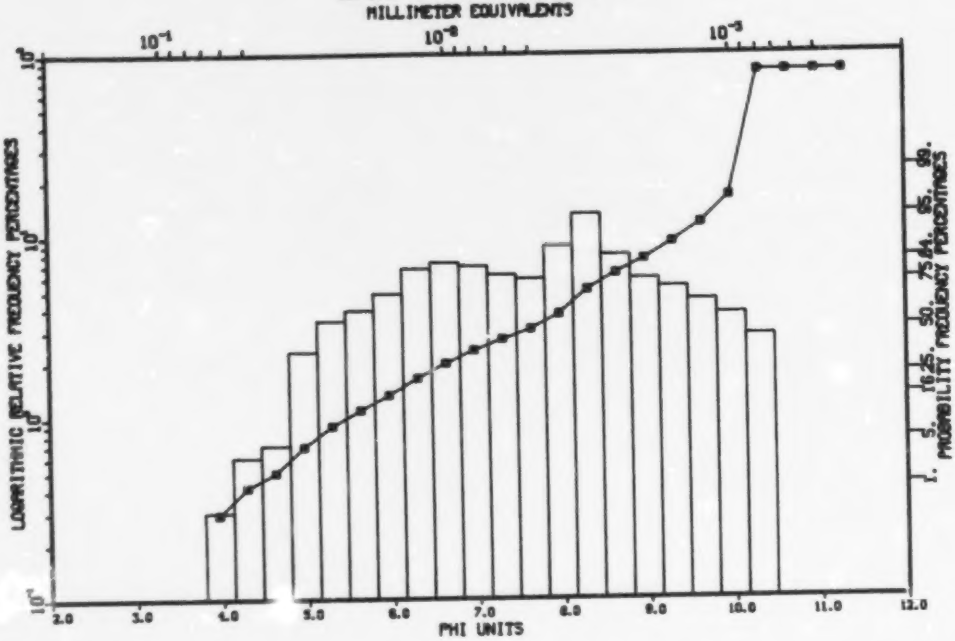
SAMPLE NO. - 978 J. SYVITSKI 8317502
CA-7.1 303 CAMBRIDGE FJORD



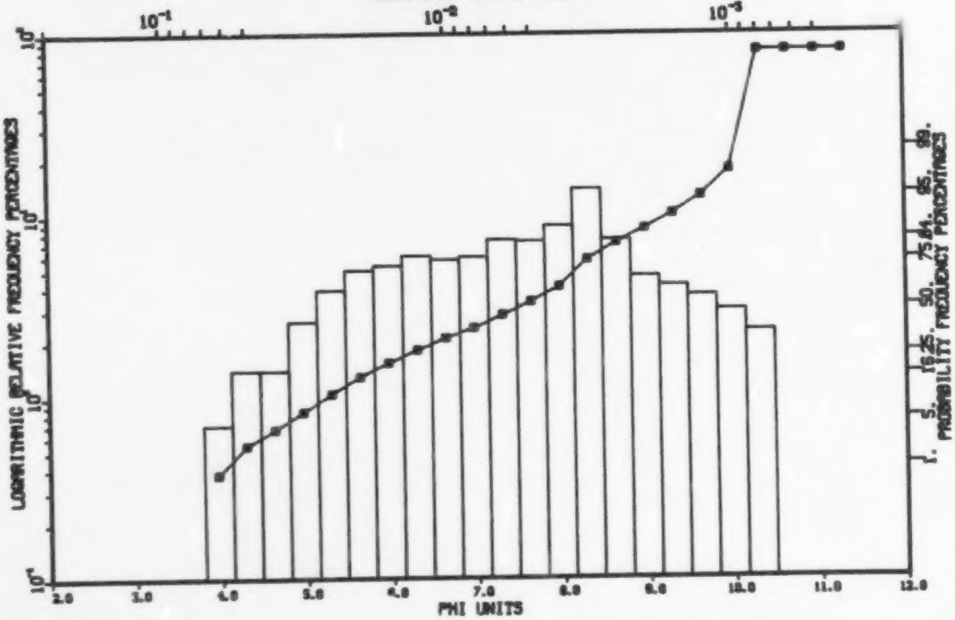
SAMPLE NO. - 979 J. SYVITSKI 8317626
CA-9.0 5 CAMBRIDGE FJORD



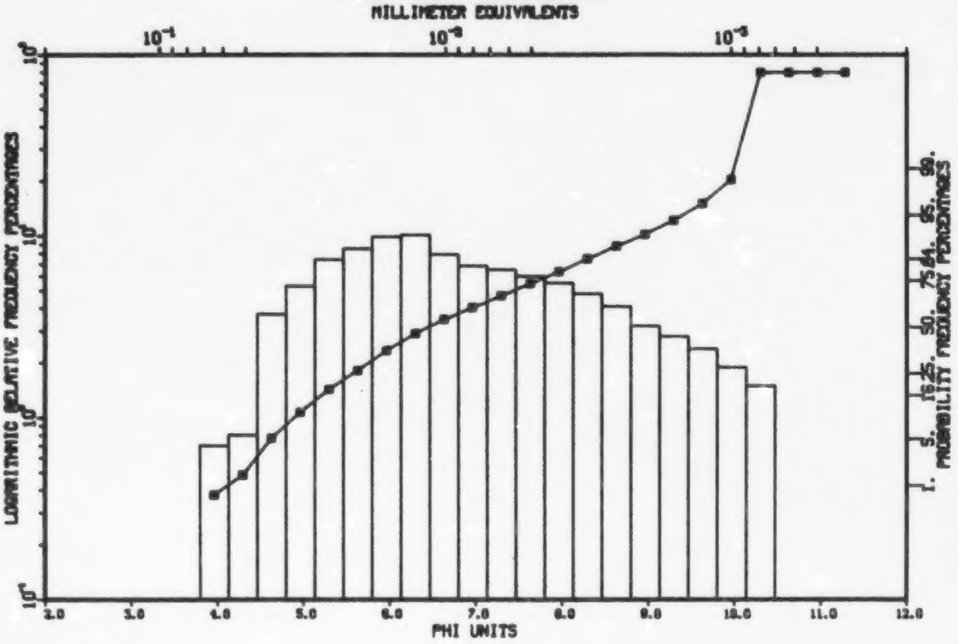
SAMPLE NO. - 980 J. SYVITSKI 8317824
CA-9.0 40 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



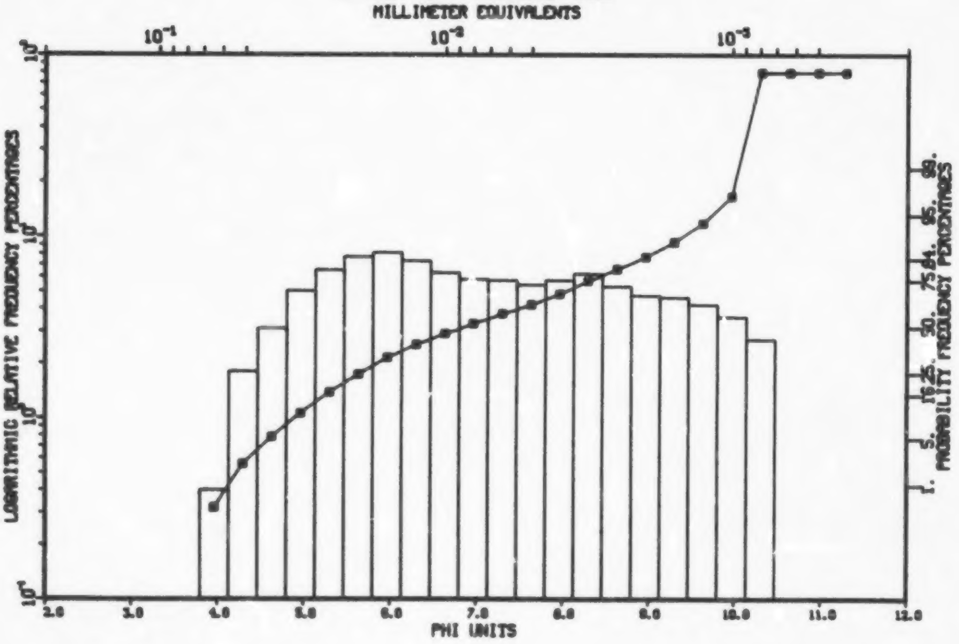
SAMPLE NO. - 981 J. SYVITSKI 8317823
CA-9.0 50 CAMBRIDGE FJORD
MILLIMETER EQUIVALENTS



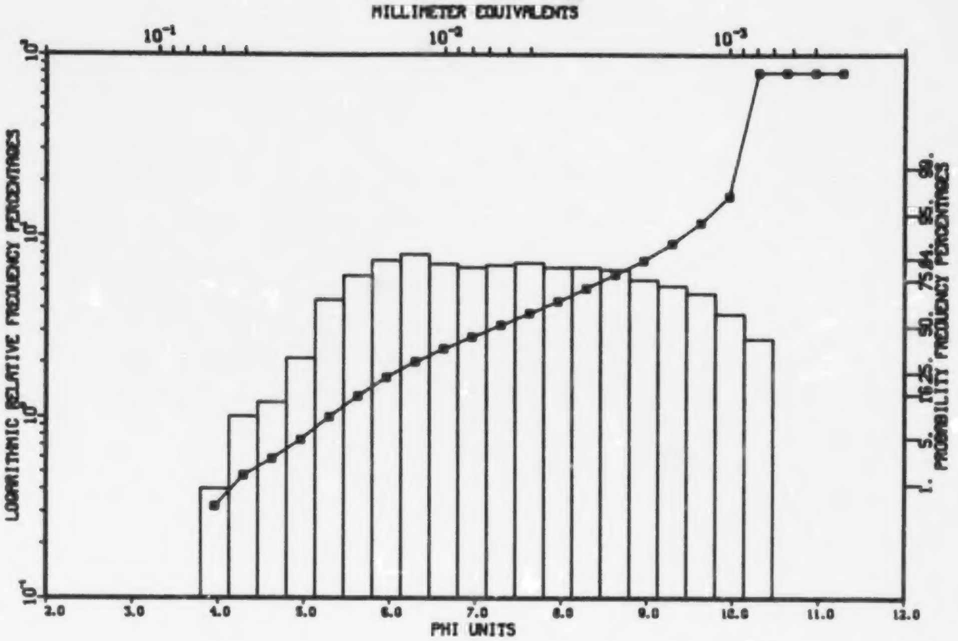
SAMPLE NO. - 882 J. SYVITSKI 8317819
CA-9.0 400 CAMBRIDGE FJORD



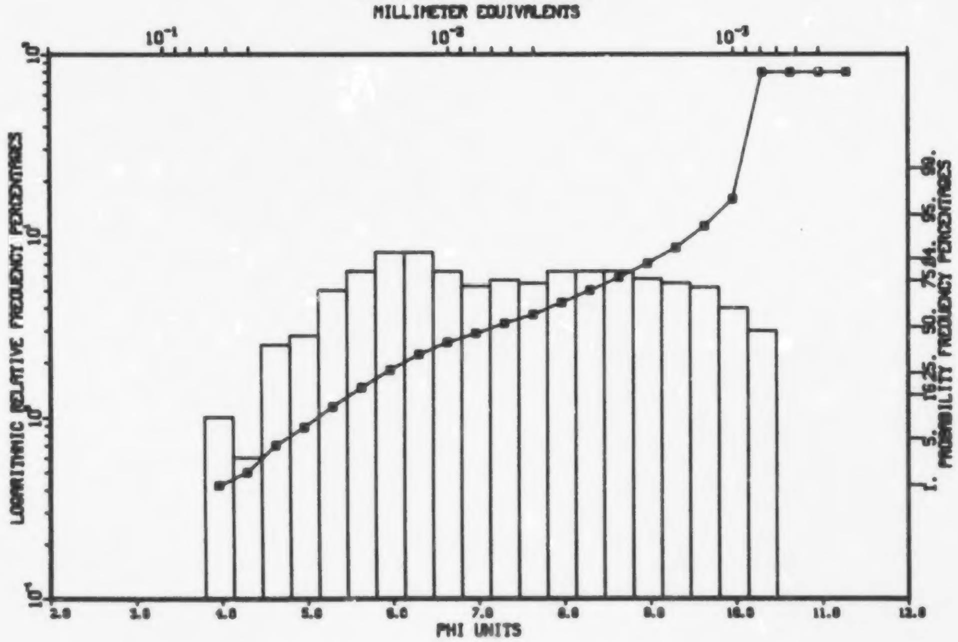
SAMPLE NO. - 883 J. SYVITSKI 8317818
CA-9.0 645 CAMBRIDGE FJORD



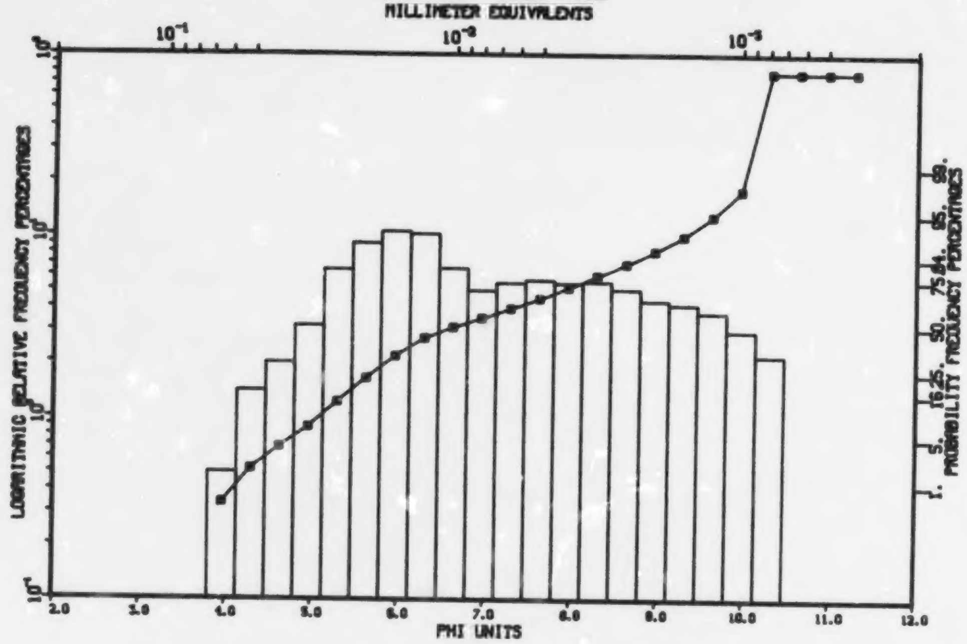
SAMPLE NO. - 1038 J. SYVITSKI 8317732
MC-0.1A 5 MCBETH FJORD



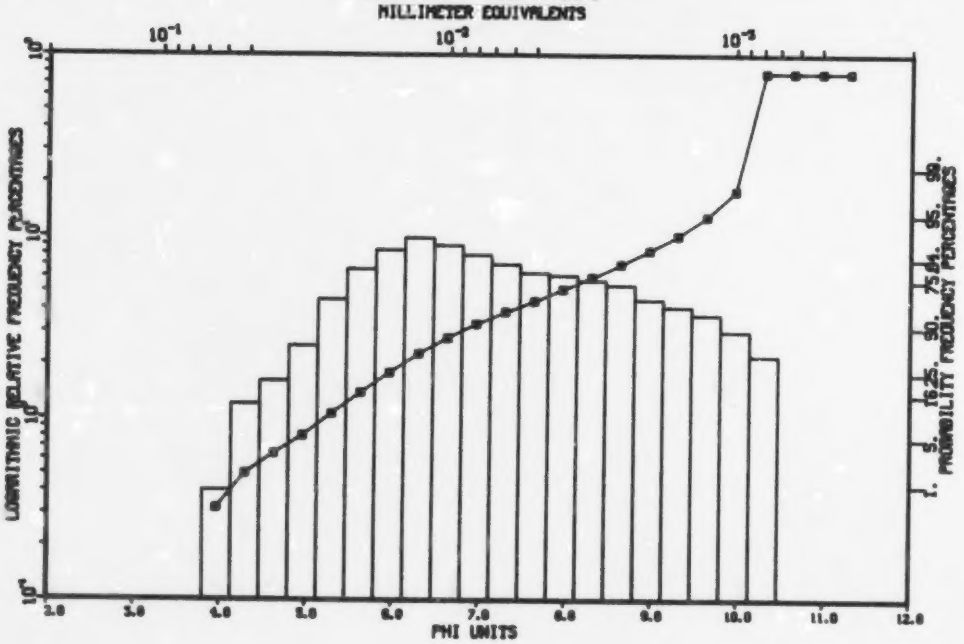
SAMPLE NO. - 1038 J. SYVITSKI 8317730
MC-0.1A 20 MCBETH FJORD

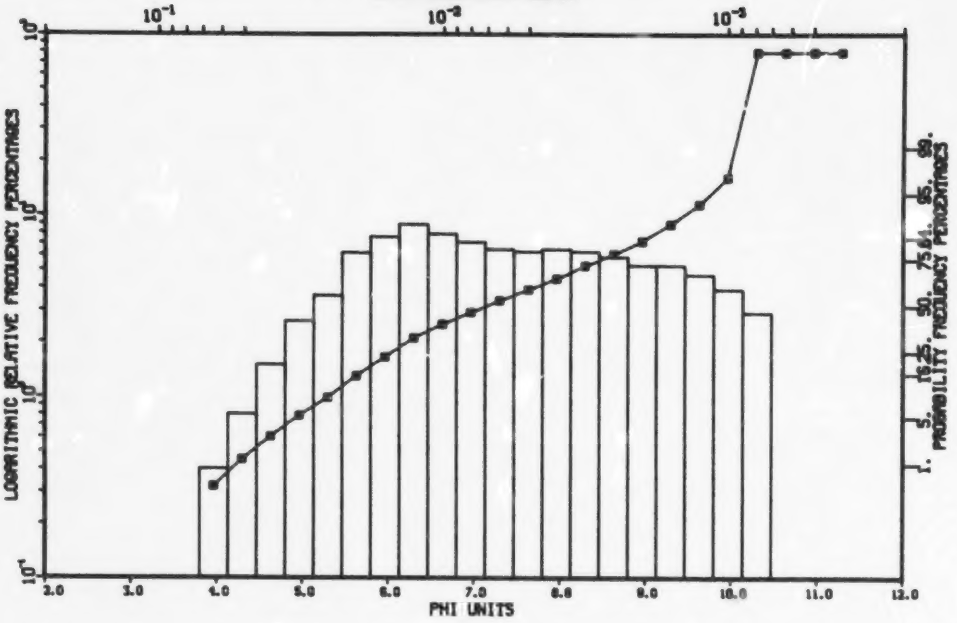


SAMPLE NO. - 1040 J. SYVITSKI 8317728
MC-0.1A 30 MCBETH FJORD

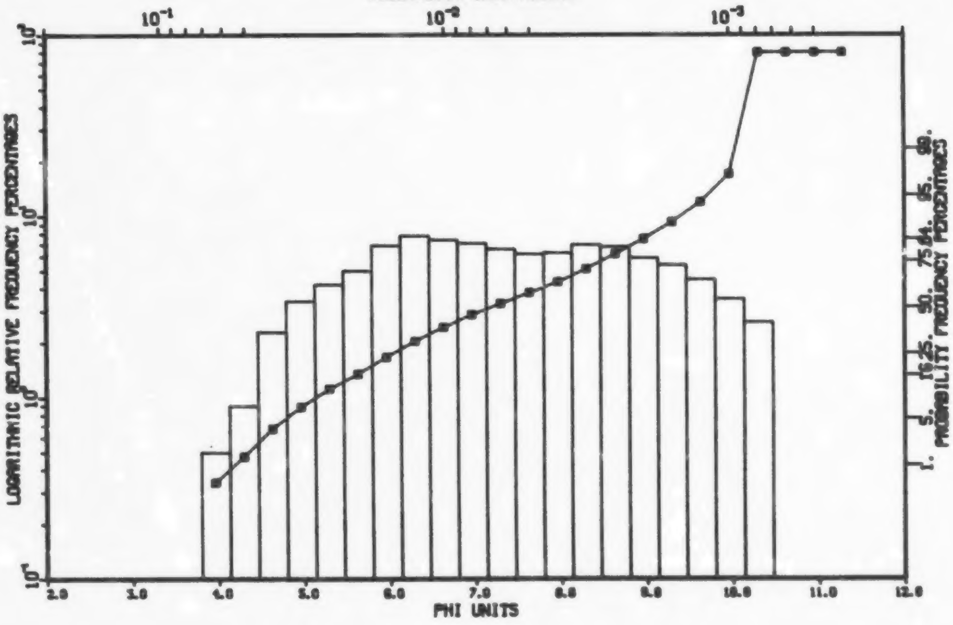


SAMPLE NO. - 1041 J. SYVITSKI 8317728
MC-0.1A 50 MCBETH FJORD



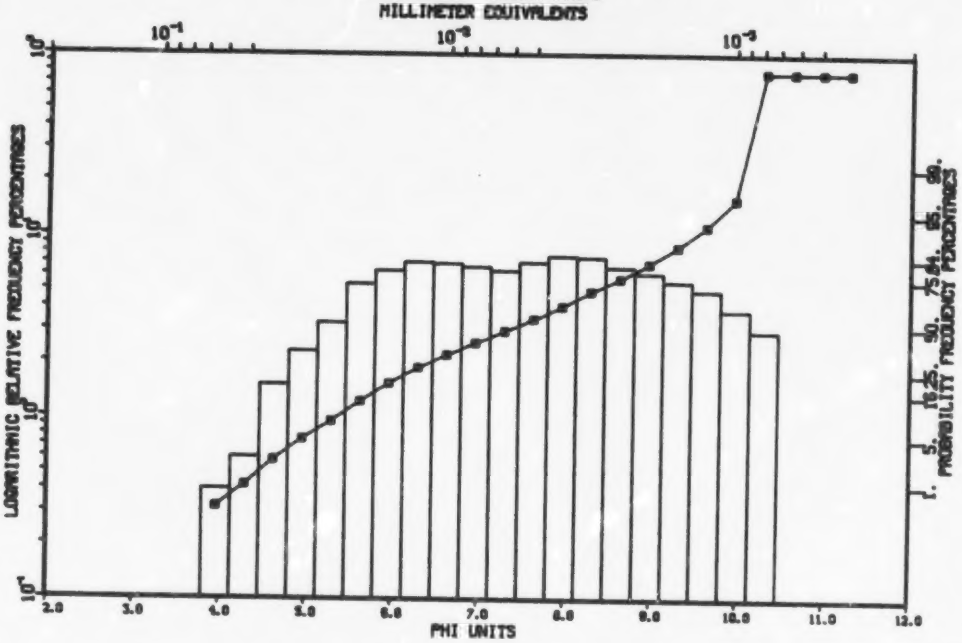


SAMPLE NO. - 1042 J. SYVITSKI 8317726
MC-0.1A 92 MCBETH FJORD
MILLIMETER EQUIVALENTS

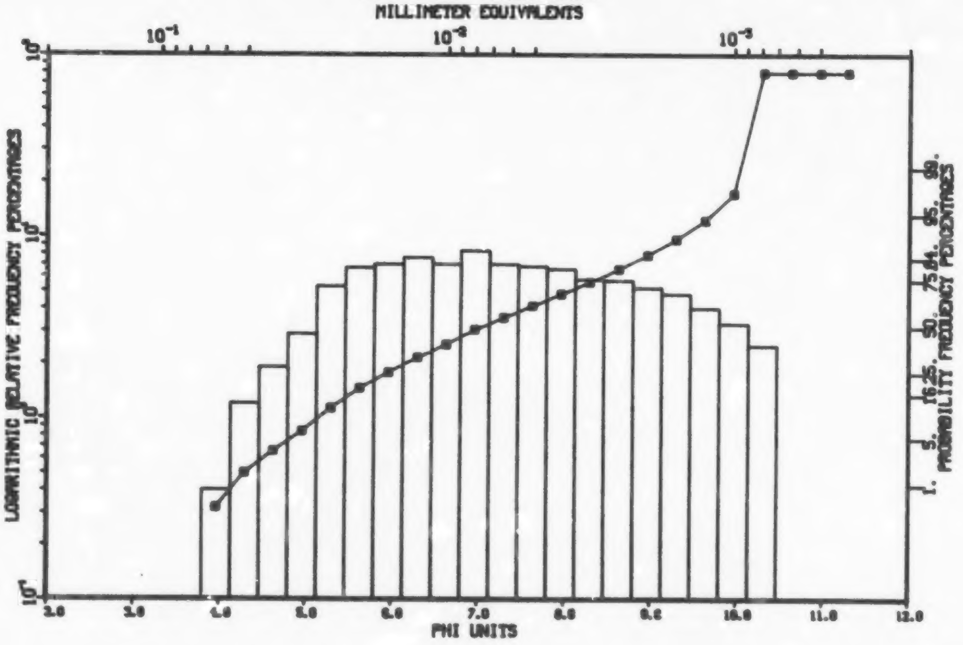


SAMPLE NO. - 1043 J. SYVITSKI 8317752
MC-0.1C 1 MCBETH FJORD
MILLIMETER EQUIVALENTS

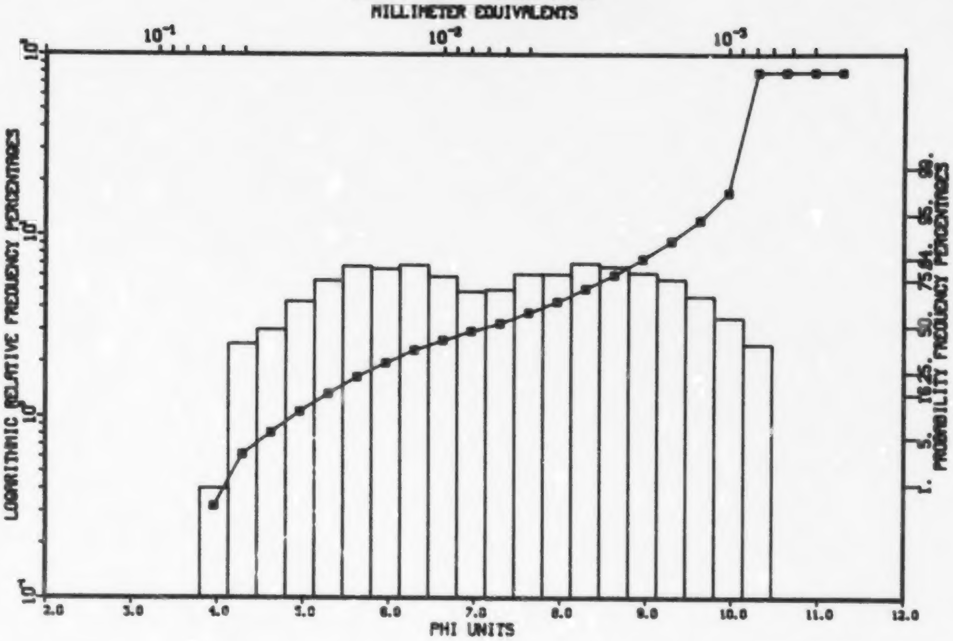
SAMPLE NO. - 1044 J. SYVITSKI 8317750
MC-0.1C 10 MCBETH FJORD



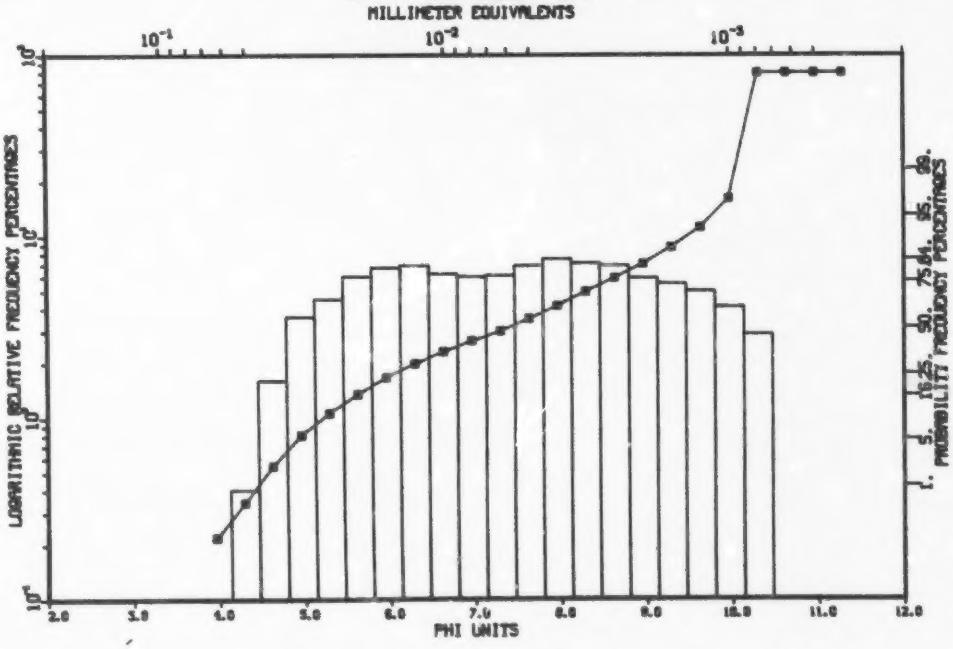
SAMPLE NO. - 1045 J. SYVITSKI 8317748
MC-0.1C 50 MCBETH FJORD



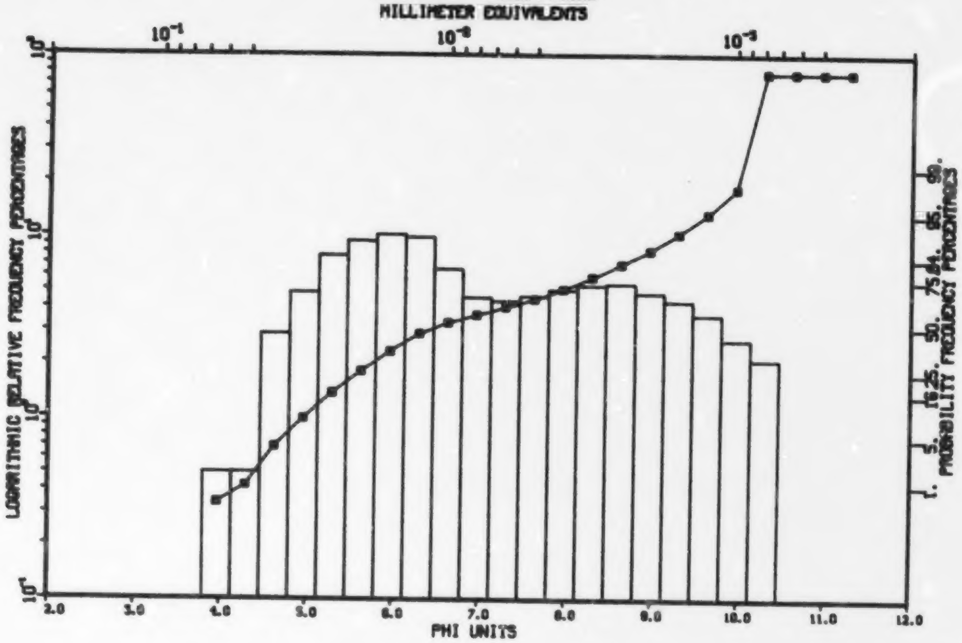
SAMPLE NO. - 1048   J. SYVITSKI   8317745
MC-0.1C 135   MCBETH FJORD



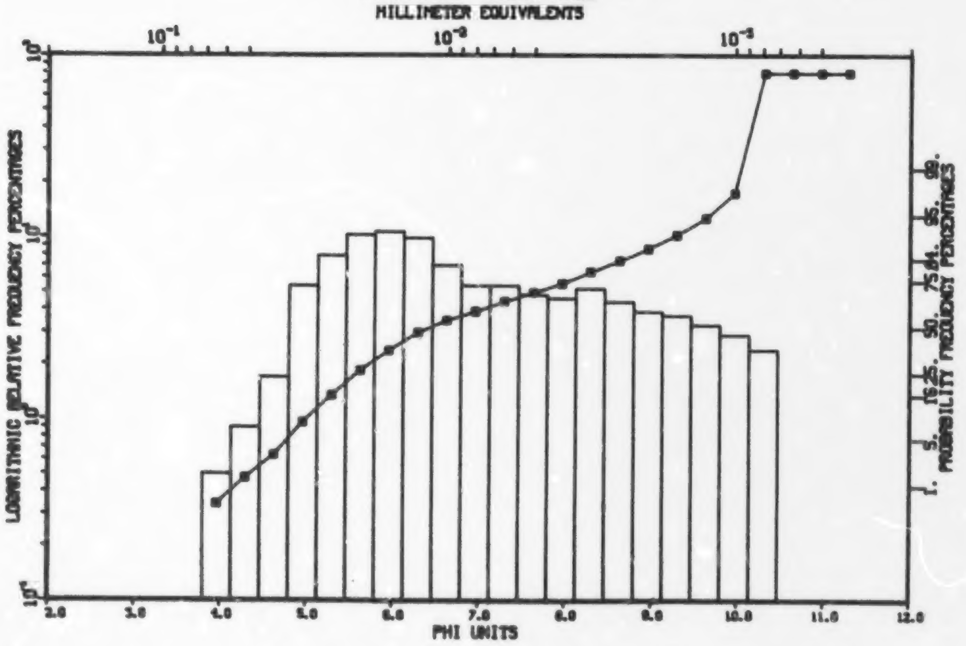
SAMPLE NO. - 1047   J. SYVITSKI   8317744
MC-0.1C 175   MCBETH FJORD



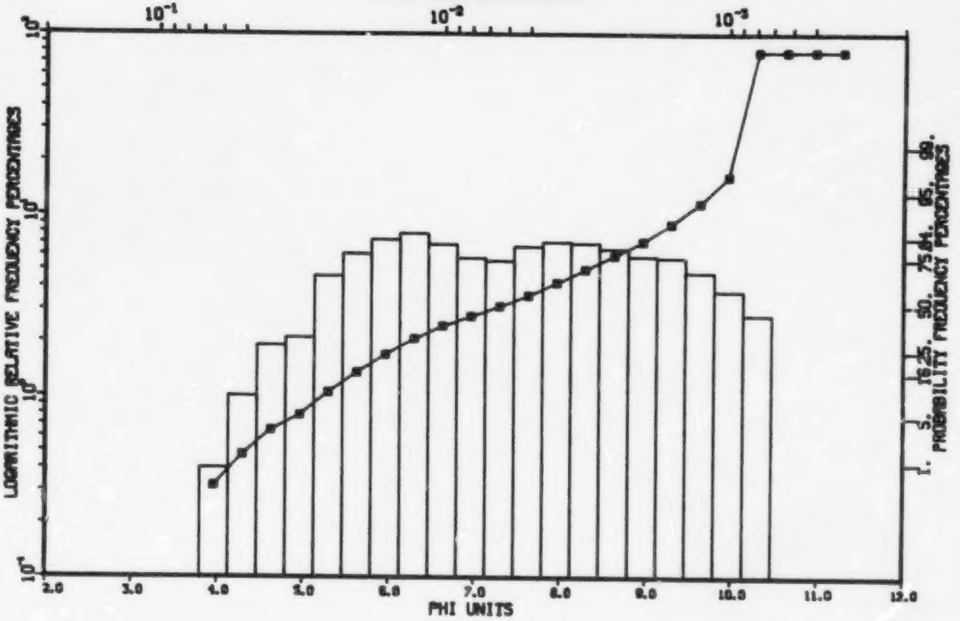
SAMPLE NO. - 1048 J. SYVITSKI 8317743
MC-2.08 S MCBETH FJORD



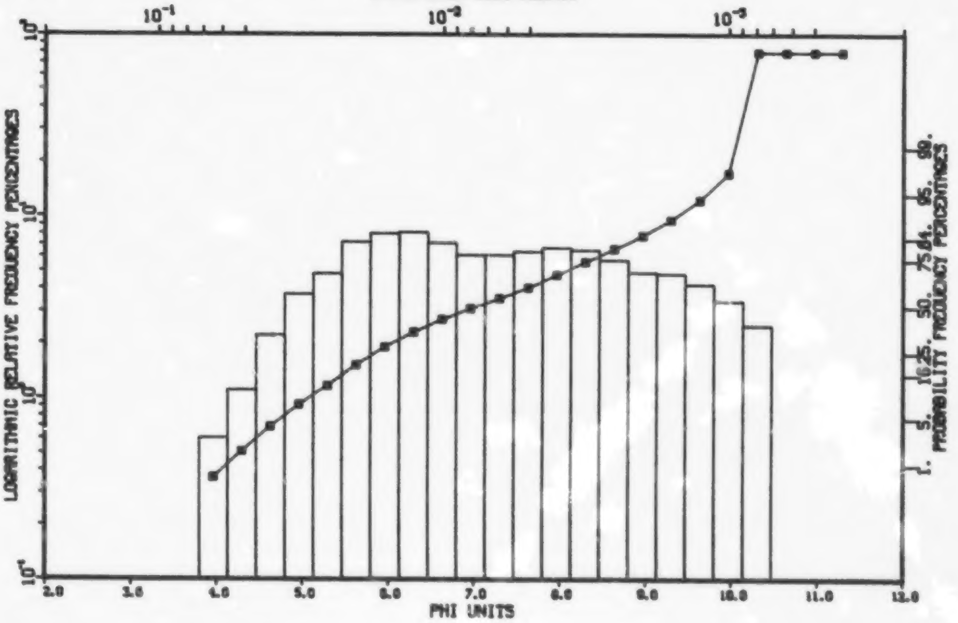
SAMPLE NO. - 1049 J. SYVITSKI 8317739
MC-2.08 SD MCBETH FJORD



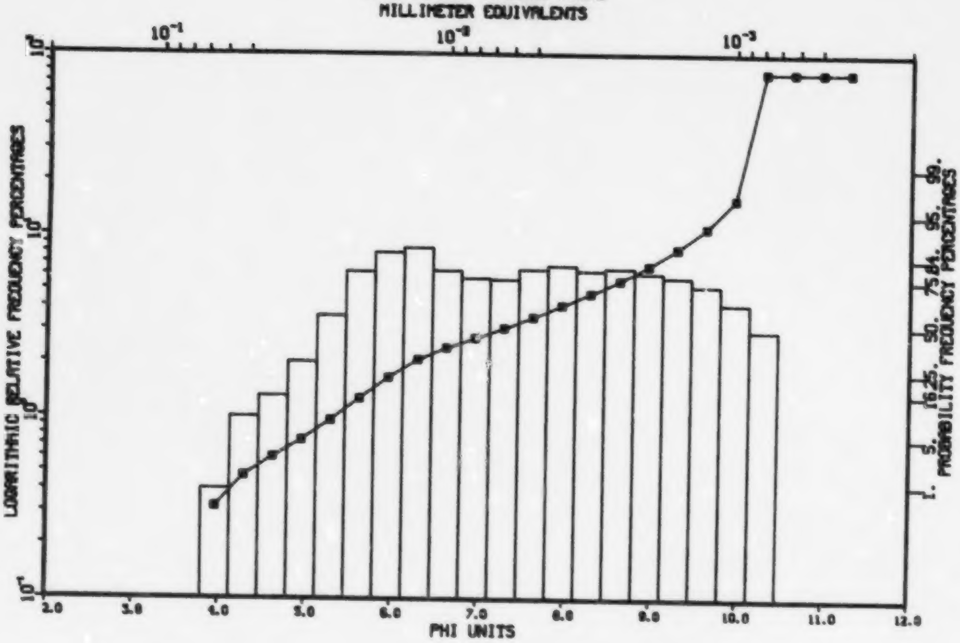
SAMPLE NO. - 1050   J. SYVITSKI   8317737
MC-2.08 185   MCBETH FJORD
MILLIMETER EQUIVALENTS



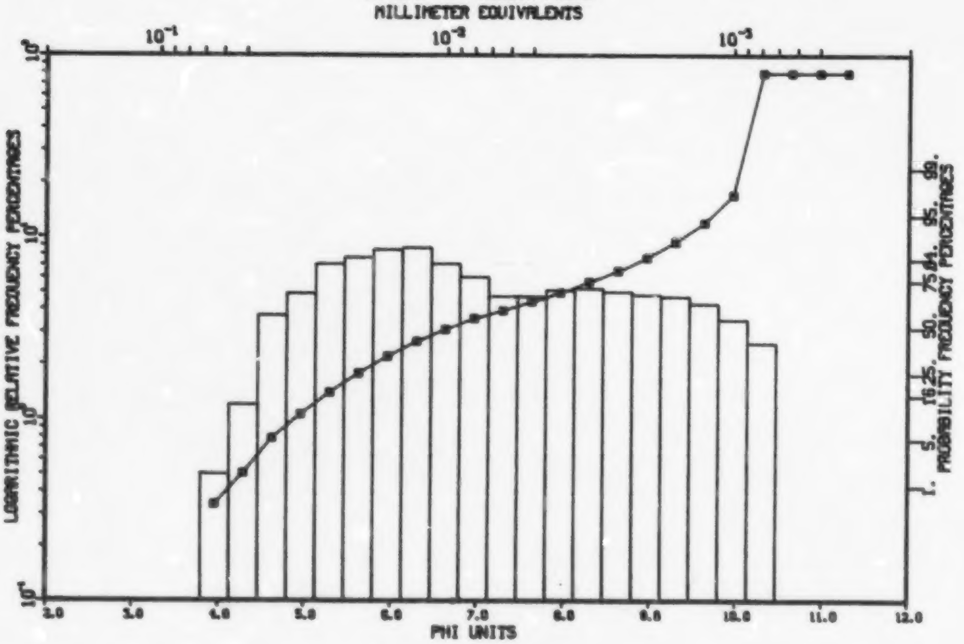
SAMPLE NO. - 1051   J. SYVITSKI   8317736
MC-2.08 250   MCBETH FJORD
MILLIMETER EQUIVALENTS



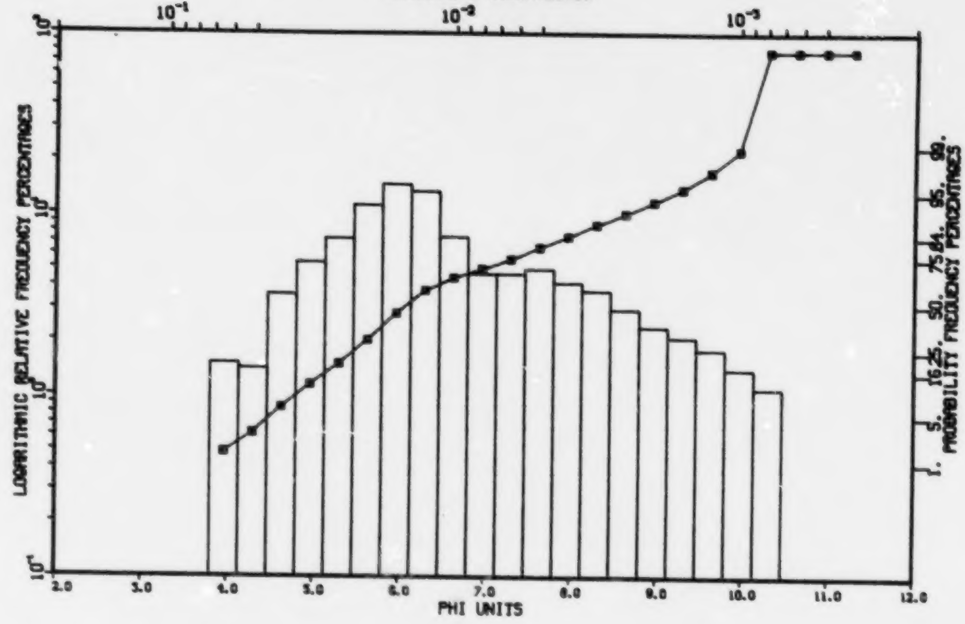
SAMPLE NO. - 1052 J. SYVITSKI 8317735
MC-2.08 310 MCBETH FJORD



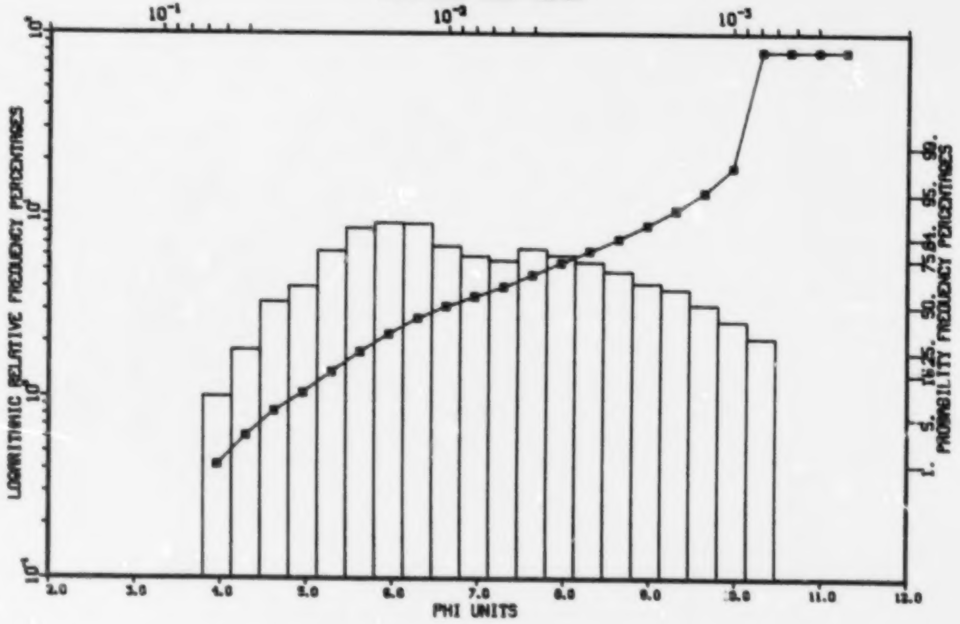
SAMPLE NO. - 1053 J. SYVITSKI 8317660
MC-2.18 5 MCBETH FJORD



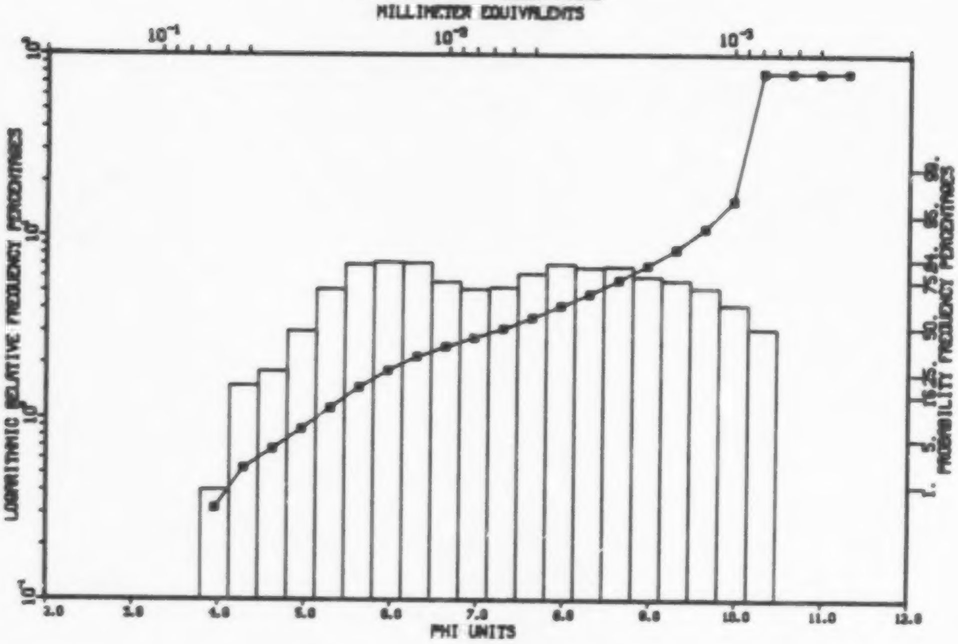
SAMPLE NO. - 1054 J. SYVITSKI 8317657
MC-2.1B 30 MCBETH FJORD
MILLIMETER EQUIVALENTS



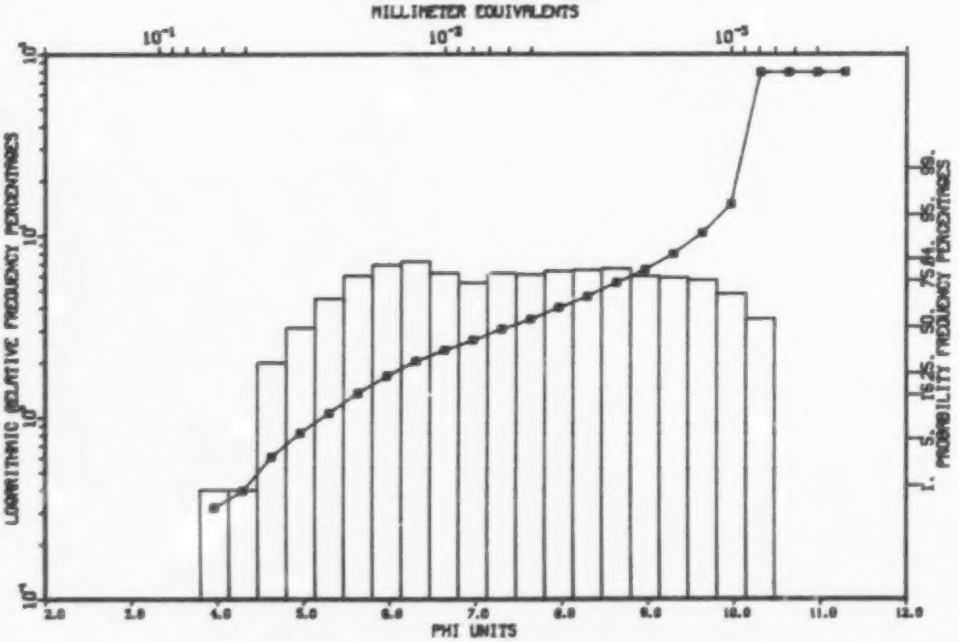
SAMPLE NO. - 1055 J. SYVITSKI 8317658
MC-2.1B 50 MCBETH FJORD
MILLIMETER EQUIVALENTS



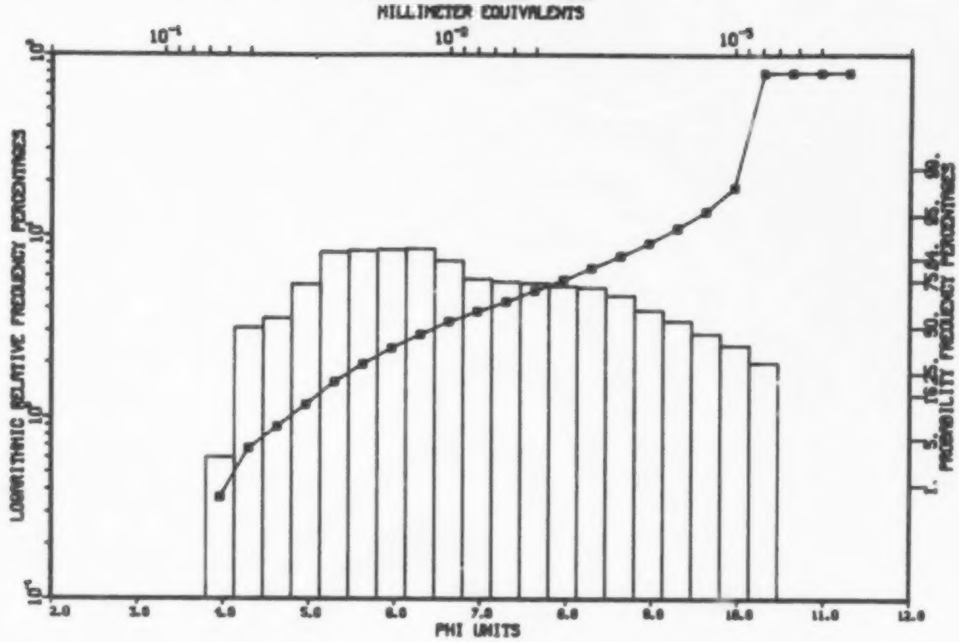
SAMPLE NO. - 1056 J. SYVITSKI 8317654
MC-2.18 175 MCBETH FJORD



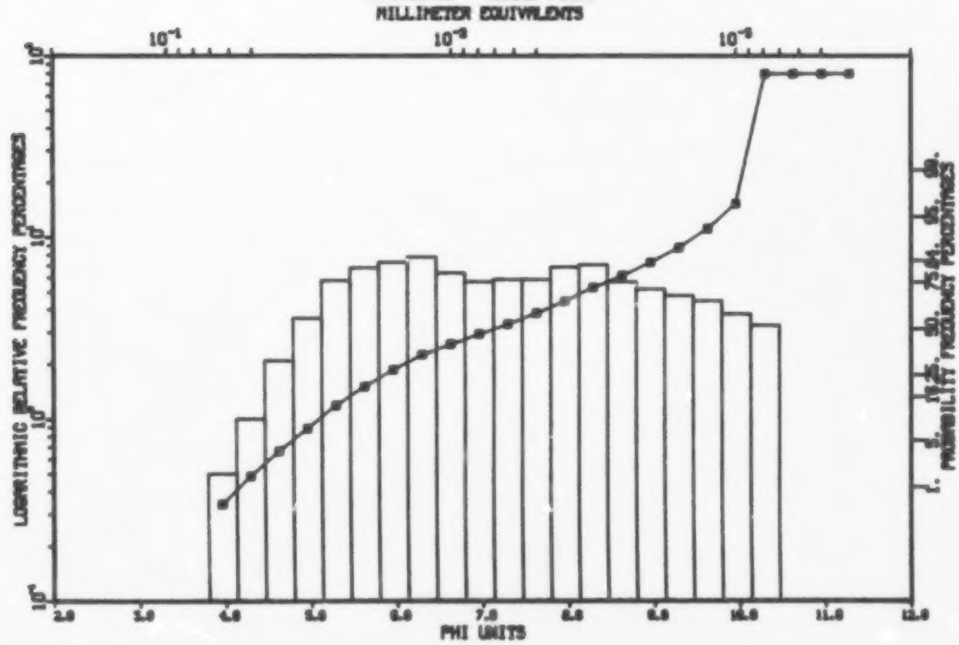
SAMPLE NO. - 1057 J. SYVITSKI 8317653
MC-2.18 308 MCBETH FJORD



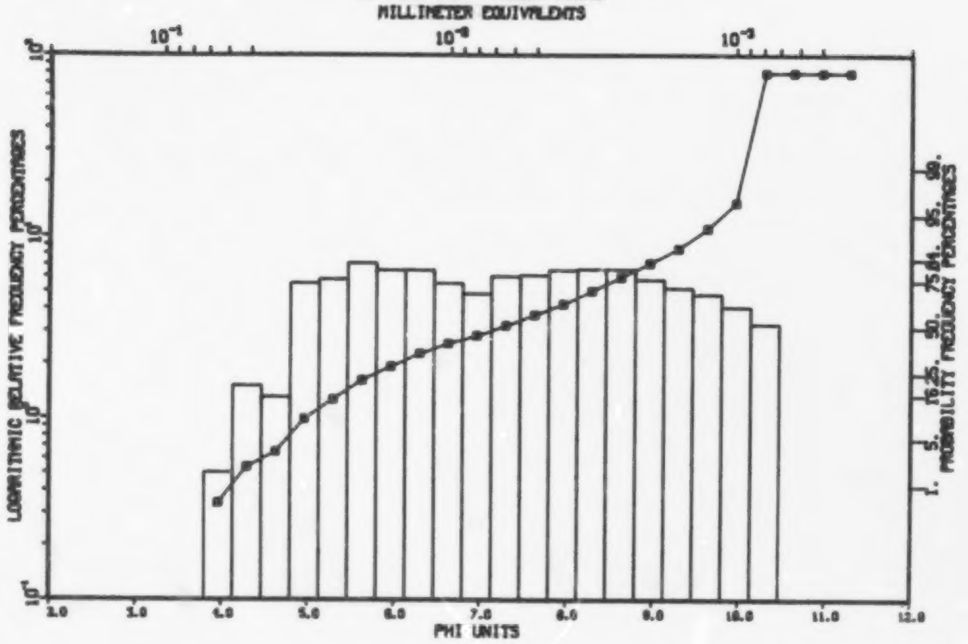
SAMPLE NO. - 1058 J. SYVITSKI 8317779
MC-3.05 1 MCBETH FJORD



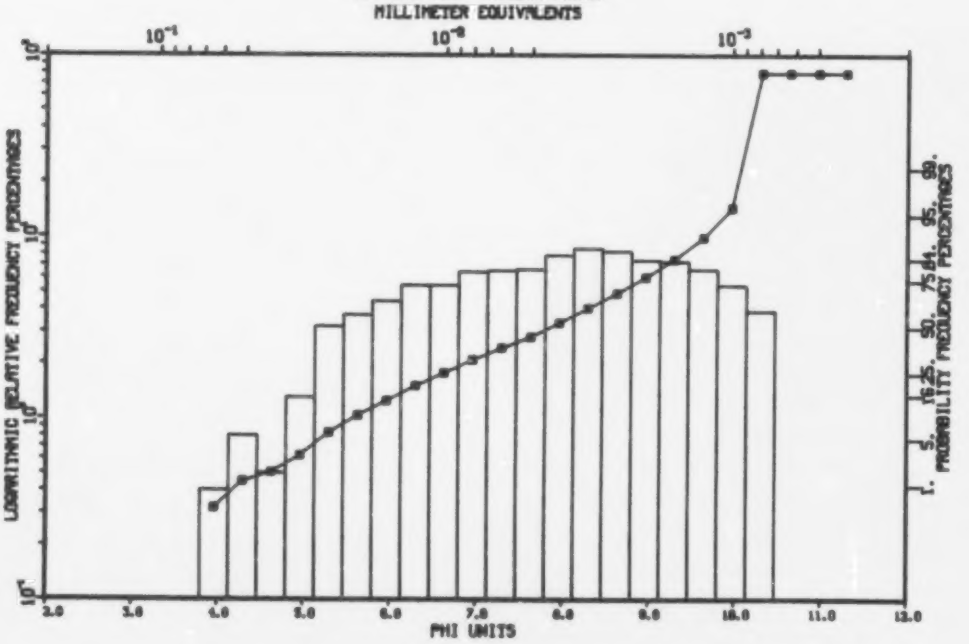
SAMPLE NO. - 1058 J. SYVITSKI 8317775
MC-3.05 30 MCBETH FJORD



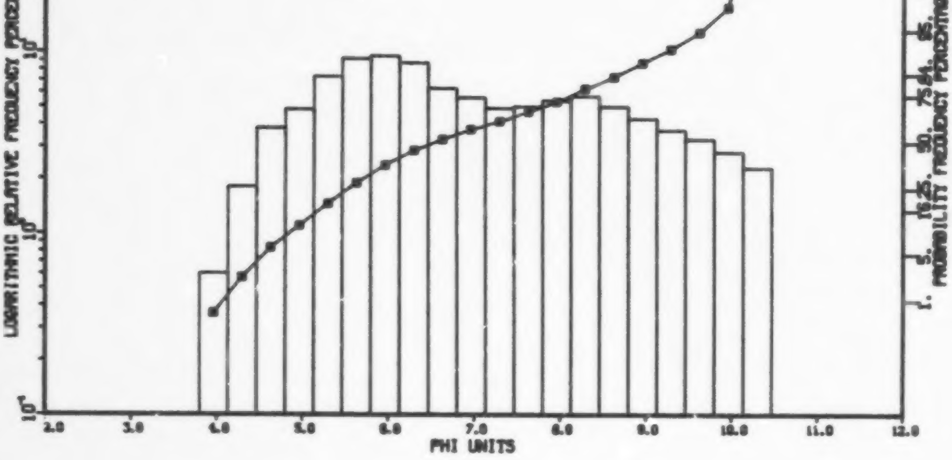
SAMPLE NO. - 1080 J. SYVITSKI 8317774
MC-3.05 100 MCBETH FJORD



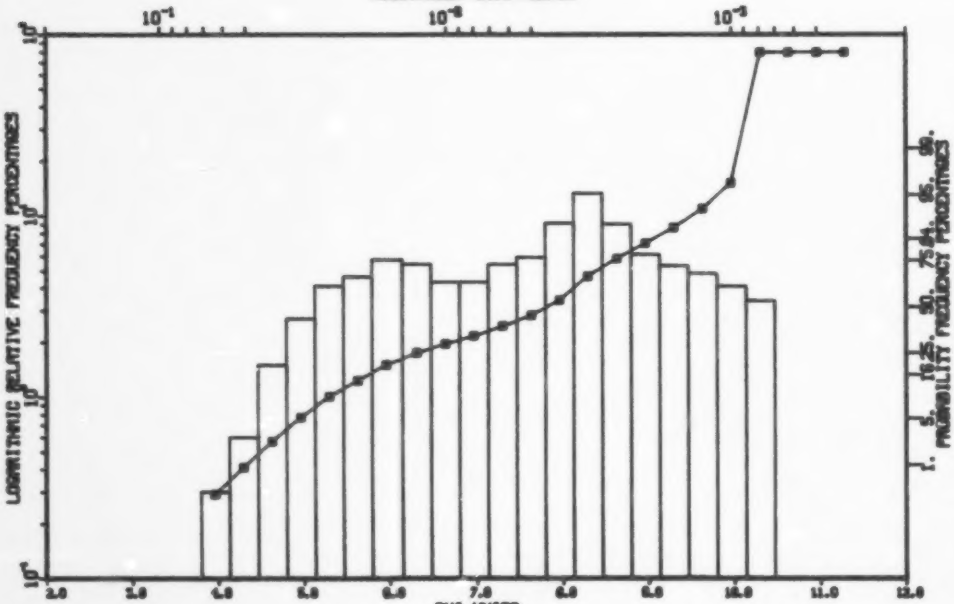
SAMPLE NO. - 1081 J. SYVITSKI 8317771
MC-3.05 525 MCBETH FJORD



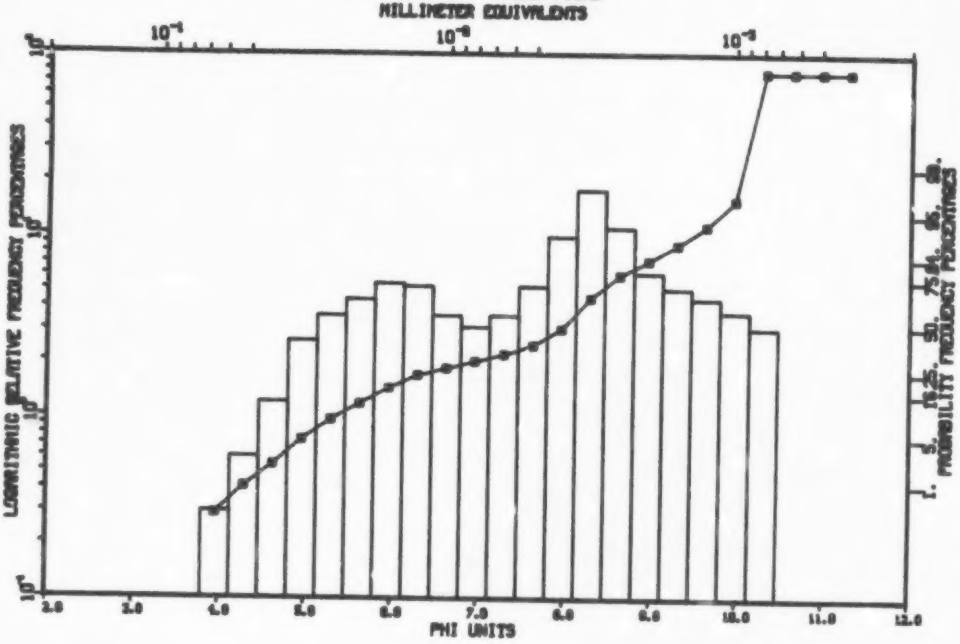
SAMPLE NO. - 1062 J. SYVITSKI 8317770
MC-4.1C 1 MCBETH FJORD



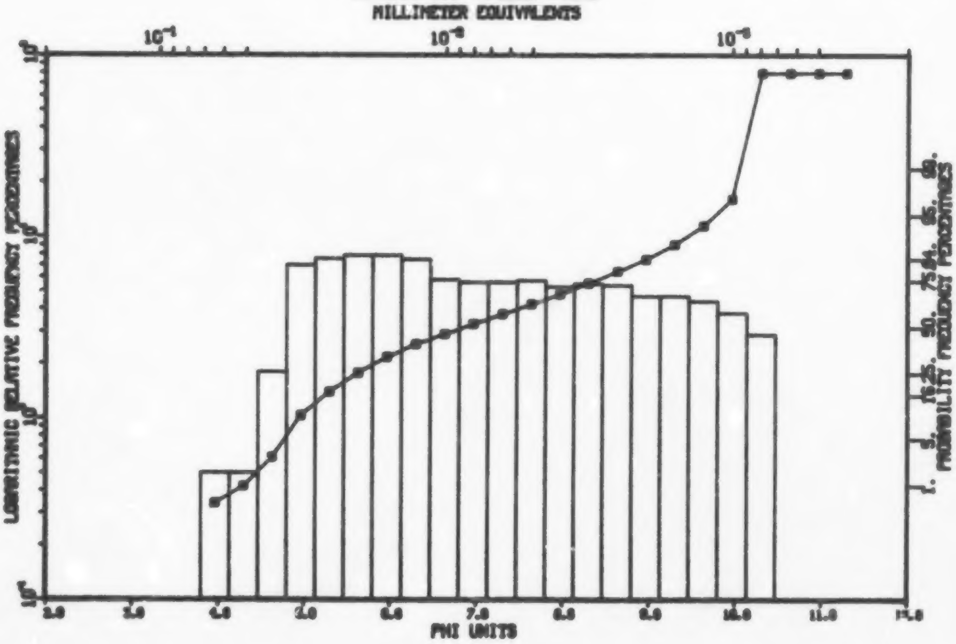
SAMPLE NO. - 1063 J. SYVITSKI 8317767
MC-4.1C 30 MCBETH FJORD



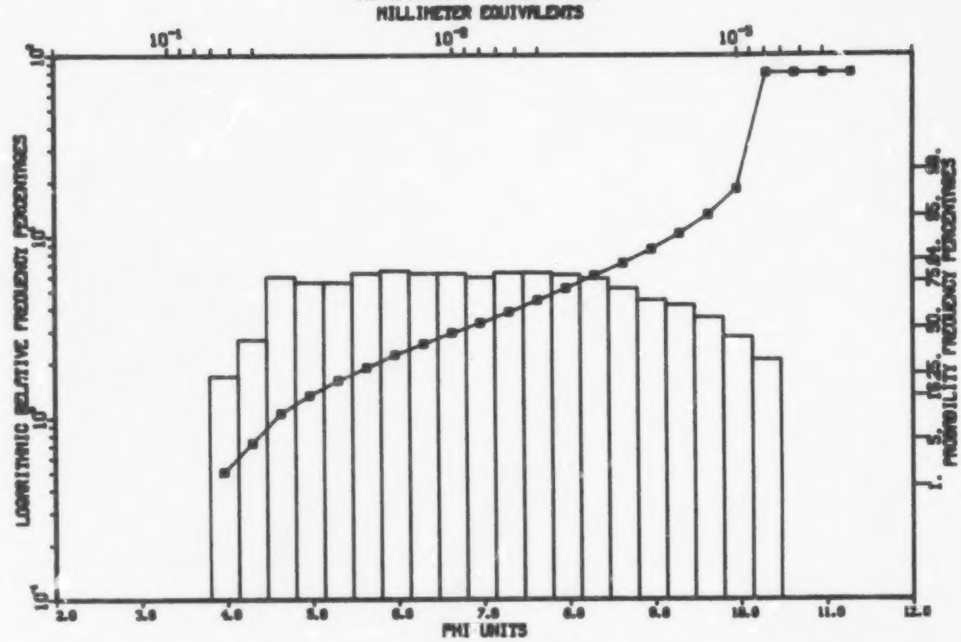
SAMPLE NO. - 1084 J. SYVITSKI 8317706
MD-4.1C 40 MCBETH FJORD



SAMPLE NO. - 1085 J. SYVITSKI 8317703
MD-4.1C 300 MCBETH FJORD



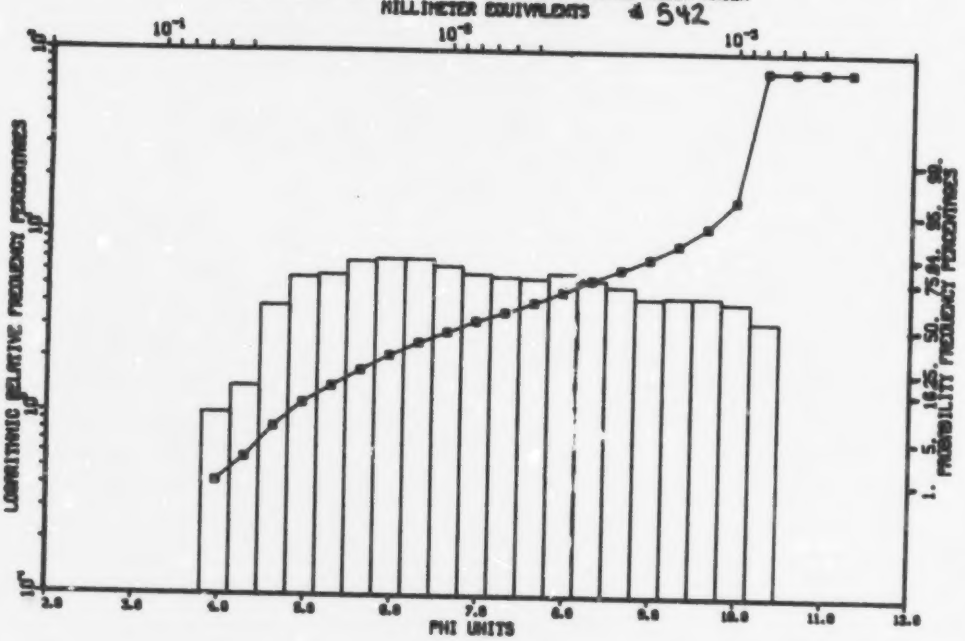
SAMPLE NO. - 1088 J. SYVITSKI 8317782
MC-4.1C S30 MCBEITH FJORD



Itirbilung

SAMPLED FROM THE MOUTH OF THE MAIN CHANNEL-DELTA WATER

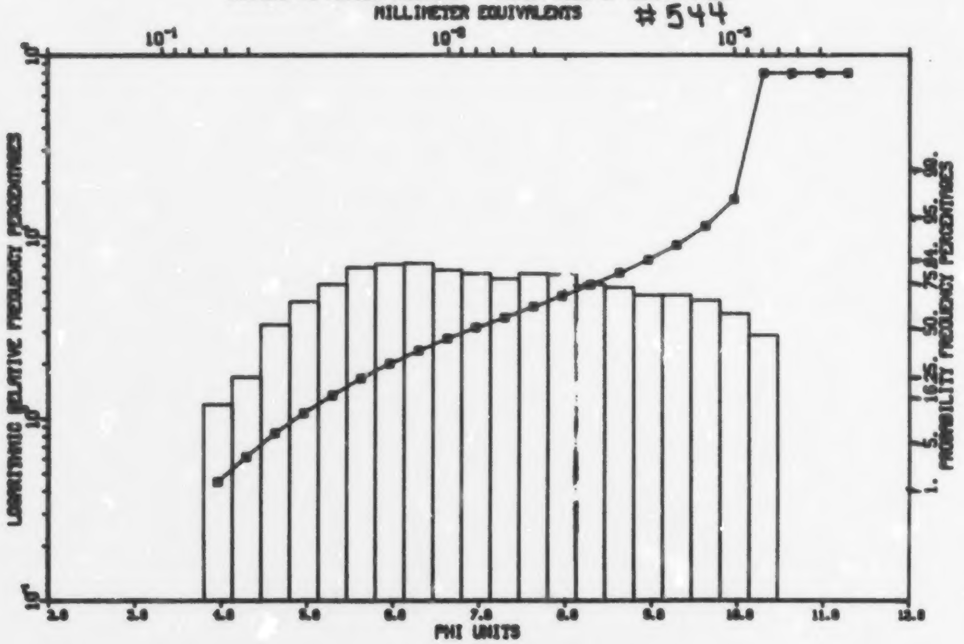
542



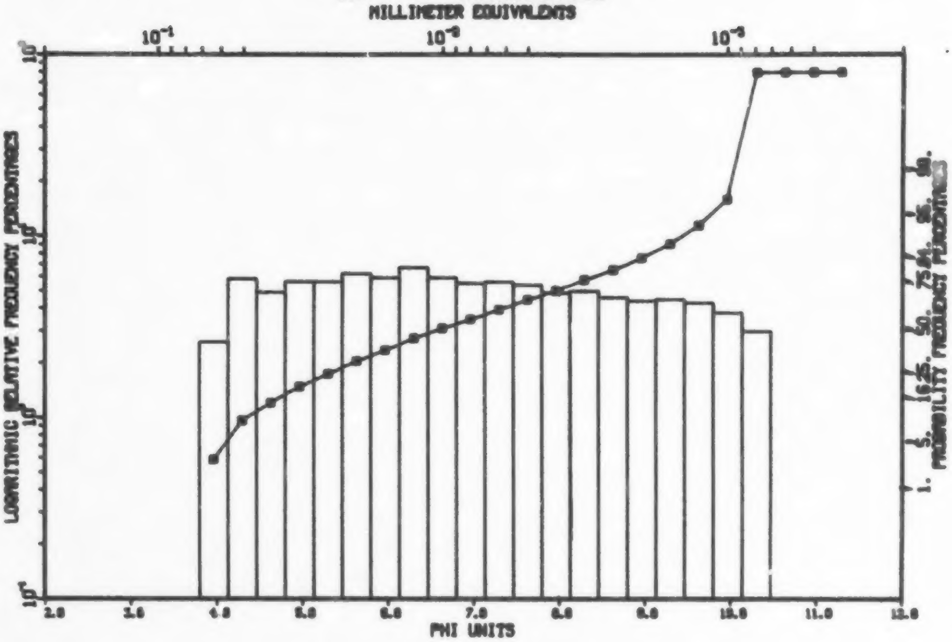
Itirbilung

SAMPLED AT WHALER MOORING NORTH SIDE OF DELTA-WATER

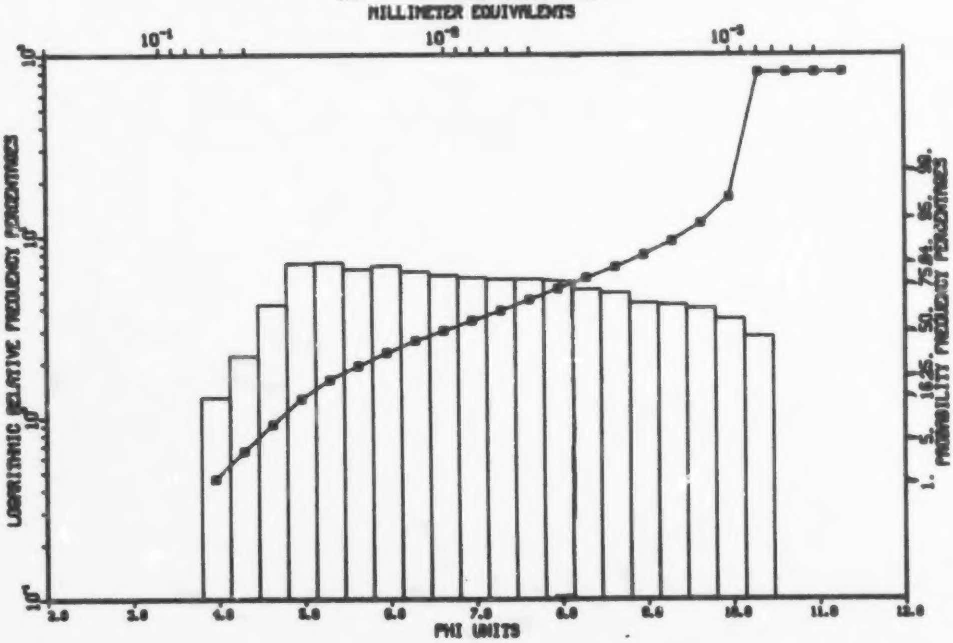
544



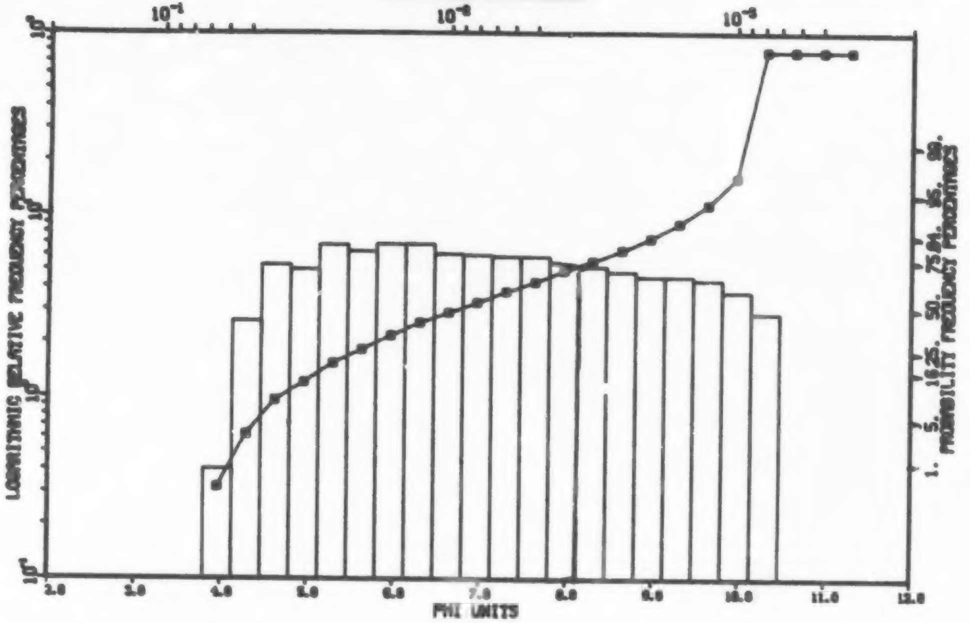
SAMPLE NO. - 544 J. SYVITSKI 8203426
IT1 1 ITERBILUNG FJORD



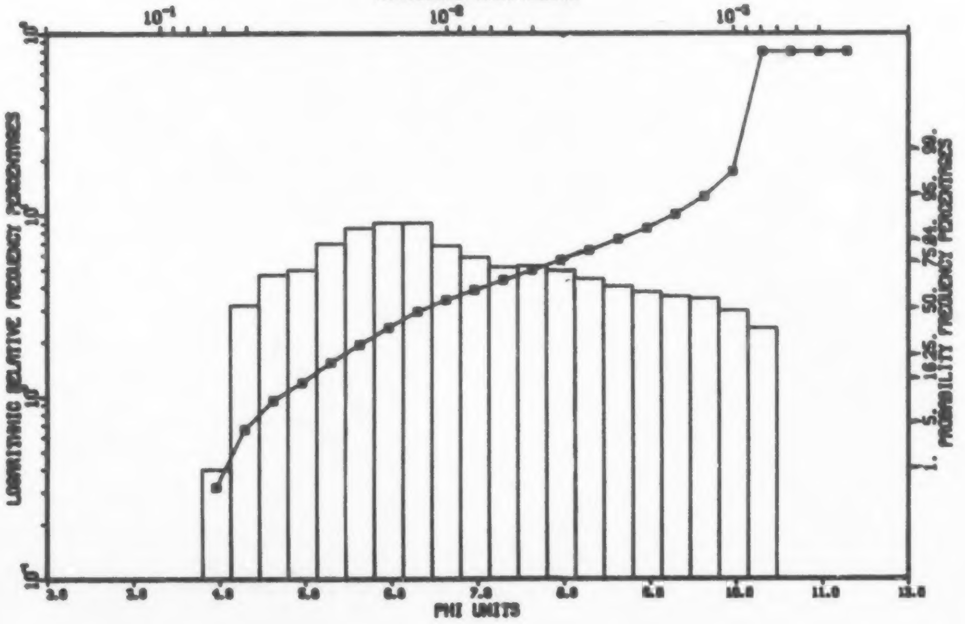
SAMPLE NO. - 545 J. SYVITSKI 8203424
IT1 5 ITERBILUNG FJORD



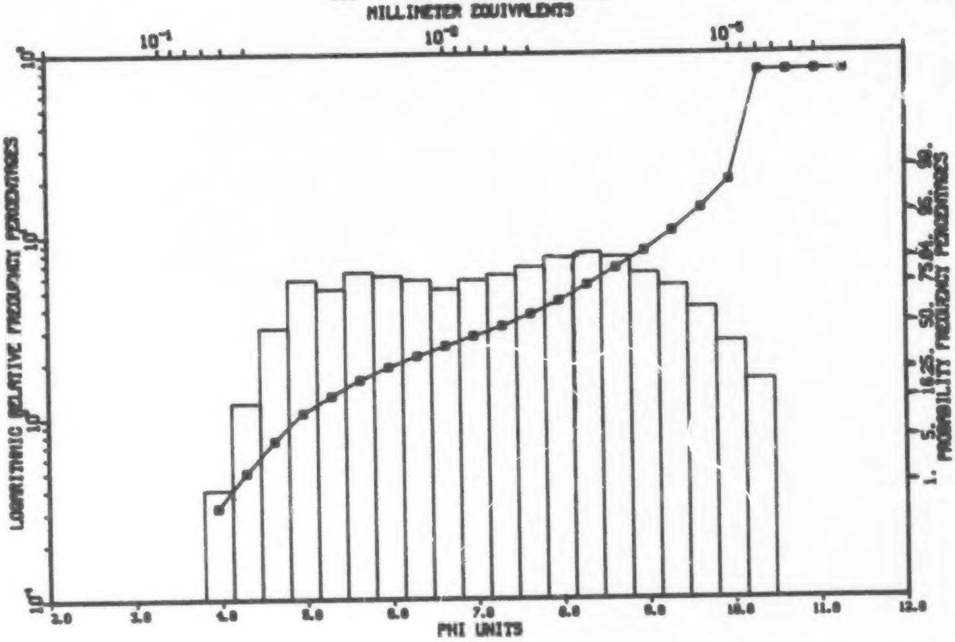
SAMPLE NO. - 546 J. SYVITSKI 8203423
ITI 10 ITERBILUNG FJORD
MILLIMETER EQUIVALENTS



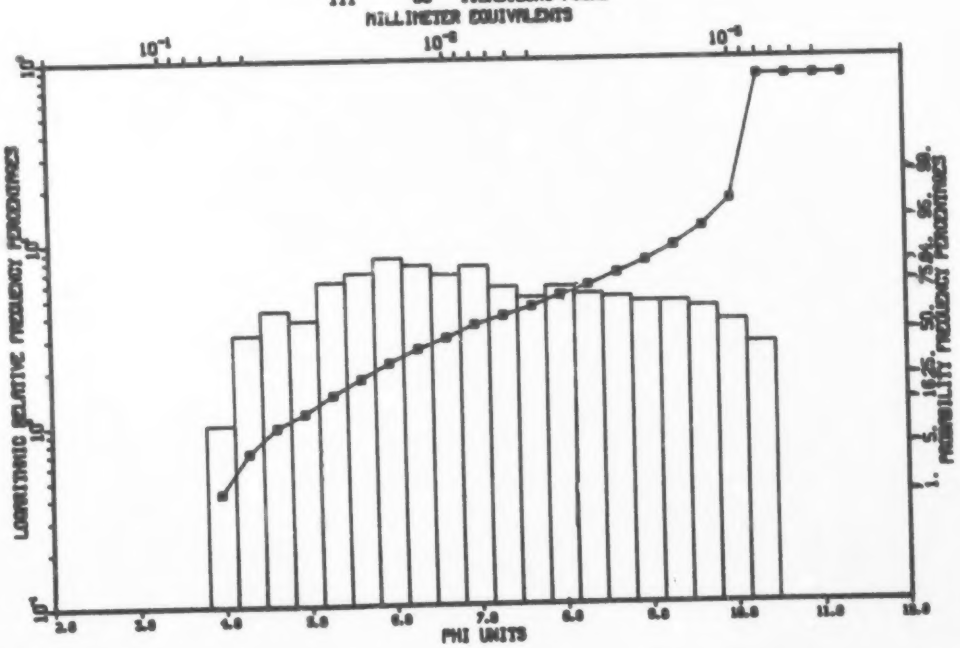
SAMPLE NO. - 547 J. SYVITSKI 8203422
ITI 20 ITERBILUNG FJORD
MILLIMETER EQUIVALENTS



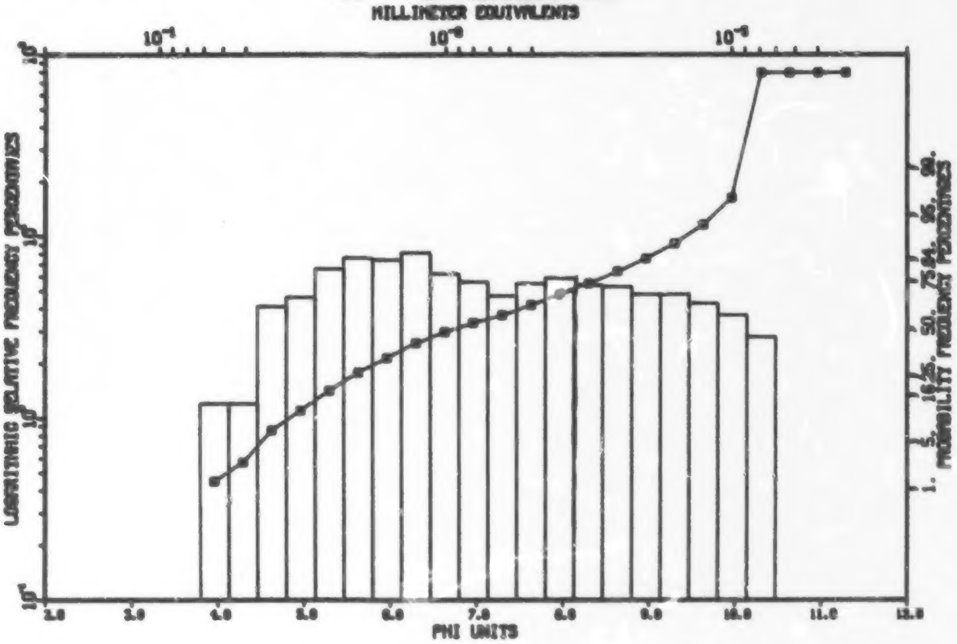
SAMPLE NO. - 548 J. SYVITSKI 8203421
IT1 30 ITERBILUNG FJORD



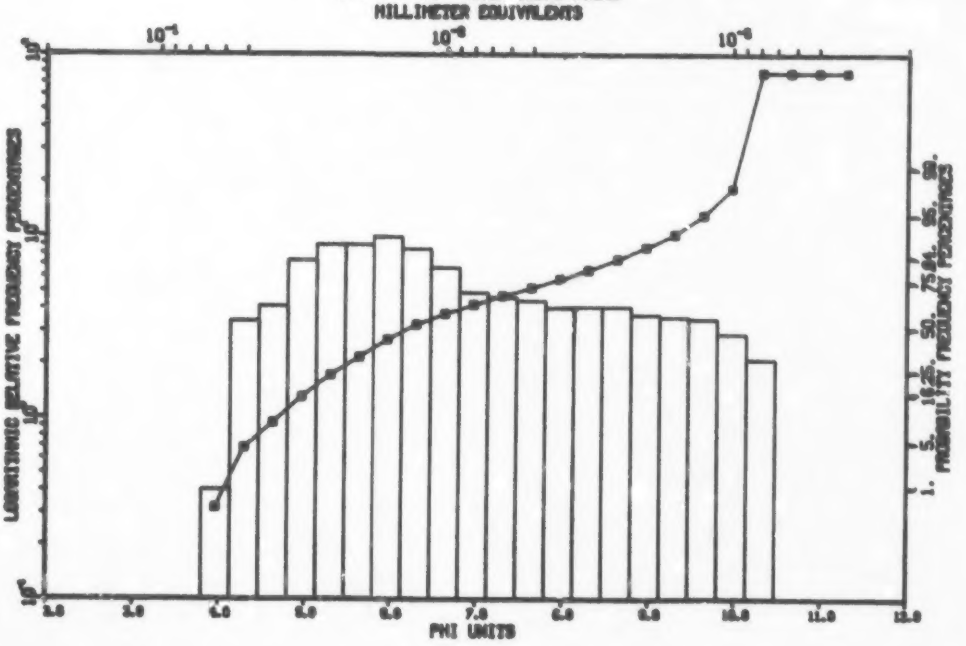
SAMPLE NO. - 550 J. SYVITSKI 8203418
IT1 50 ITERBILUNG FJORD



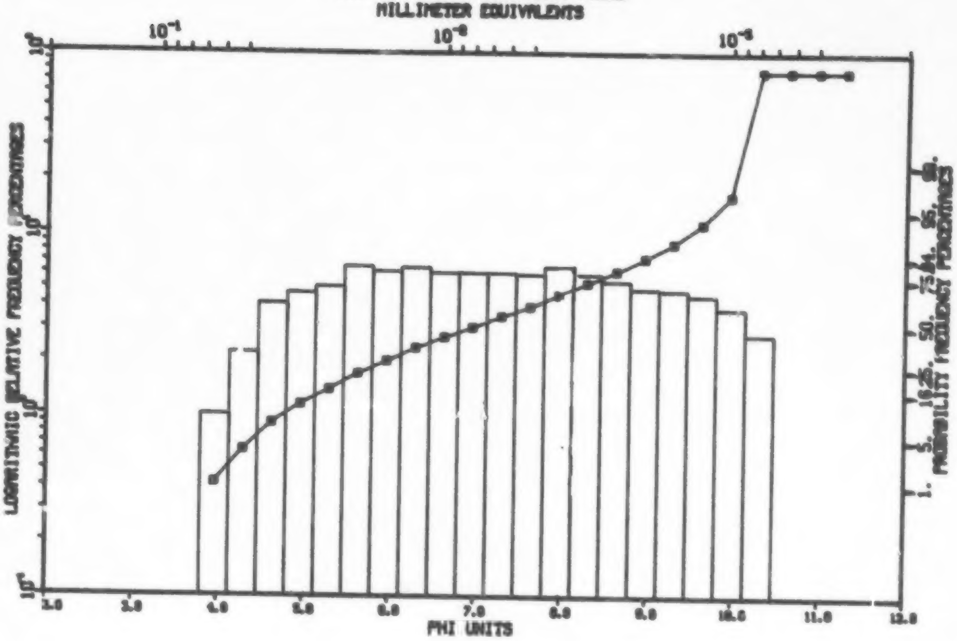
SAMPLE NO. - 540 J. SYVITSKI 8203420
IT1 40 ITERBILUNG FJORD



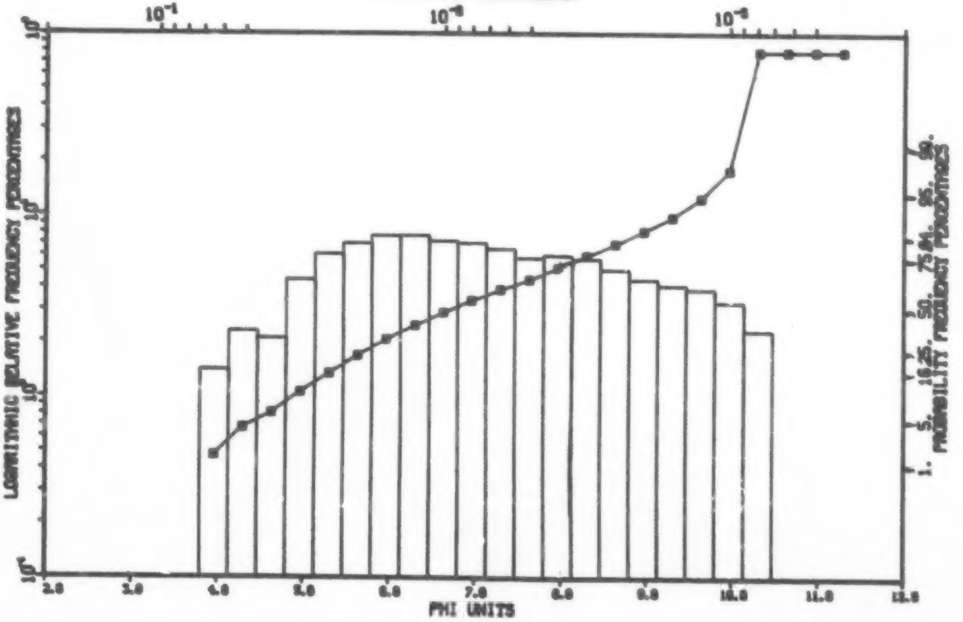
SAMPLE NO. - 551 J. SYVITSKI 8203410
IT1 75 ITERPILUNG FJORD



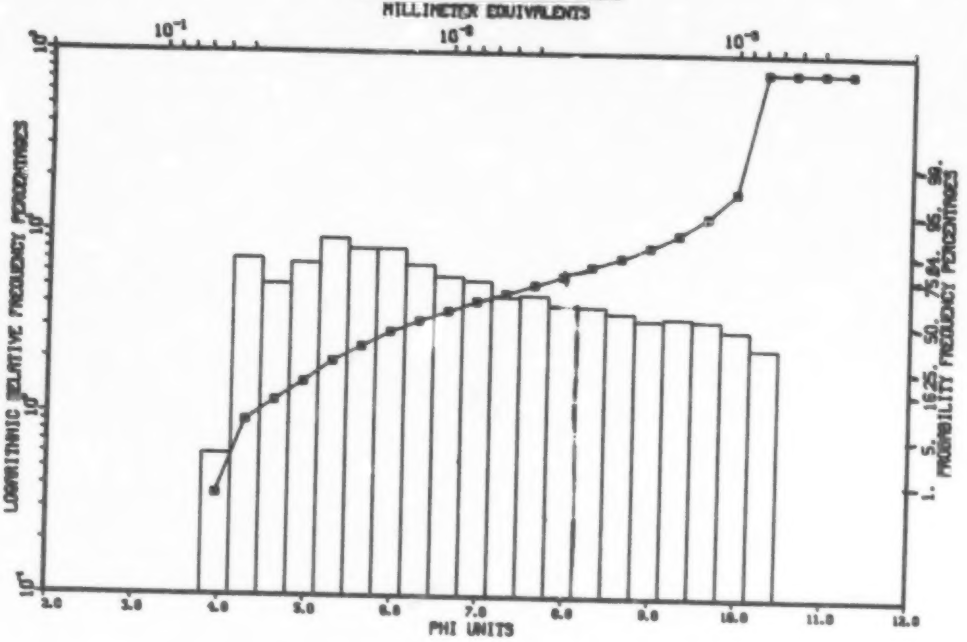
SAMPLE NO. - 562 J. SYVITSKI 8203417
IT1 100 ITERBILUNG FJORD



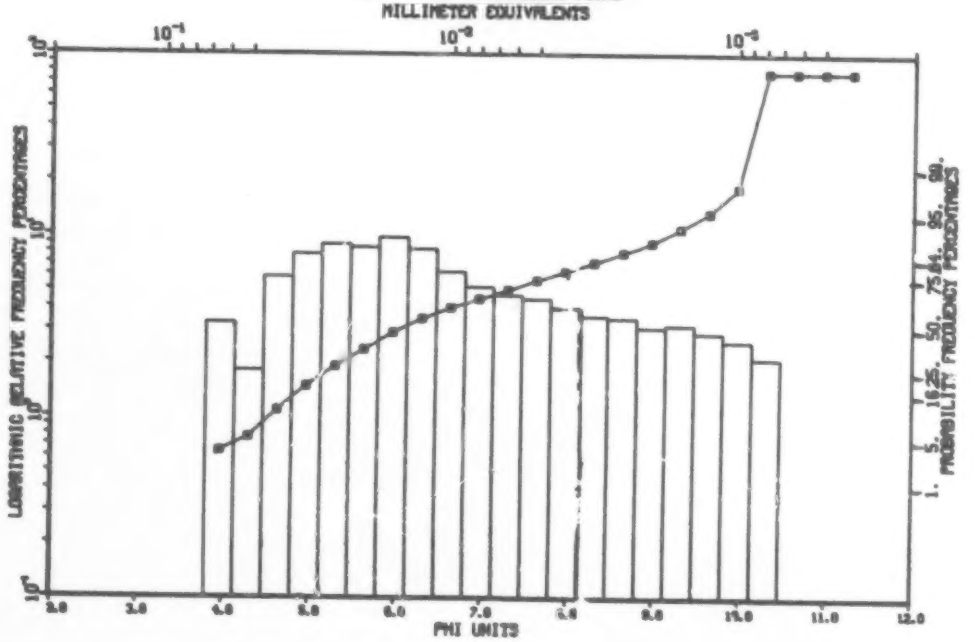
SAMPLE NO. - 563 J. SYVITSKI 8203416
IT1 145 ITERBILUNG FJORD



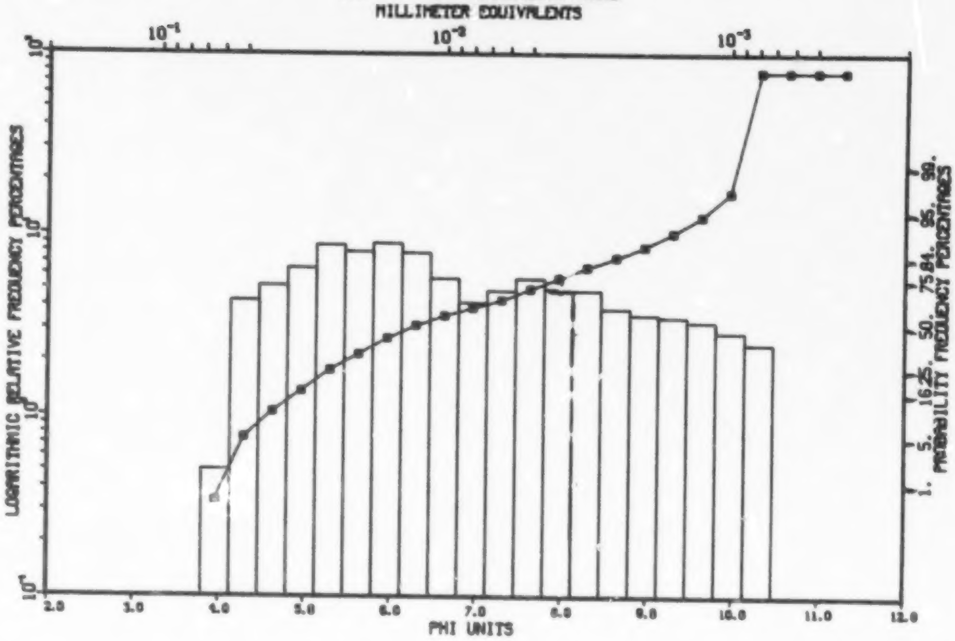
SAMPLE NO. - 554 J. SYVITSKI 8203435
IT2 1 ITERBILUNG FJORD



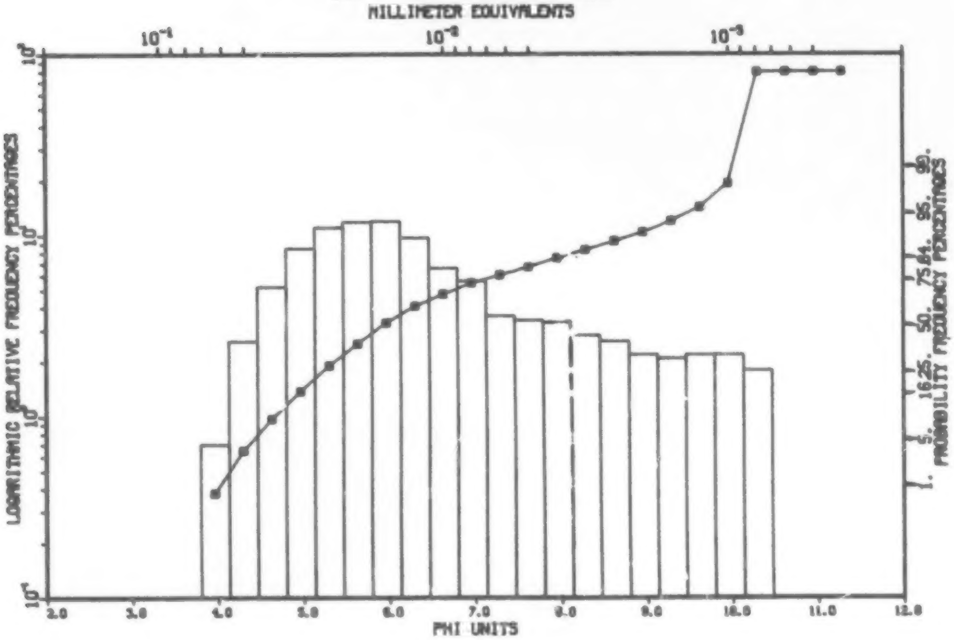
SAMPLE NO. - 555 J. SYVITSKI 8203434
IT2 5 ITERBILUNG FJORD

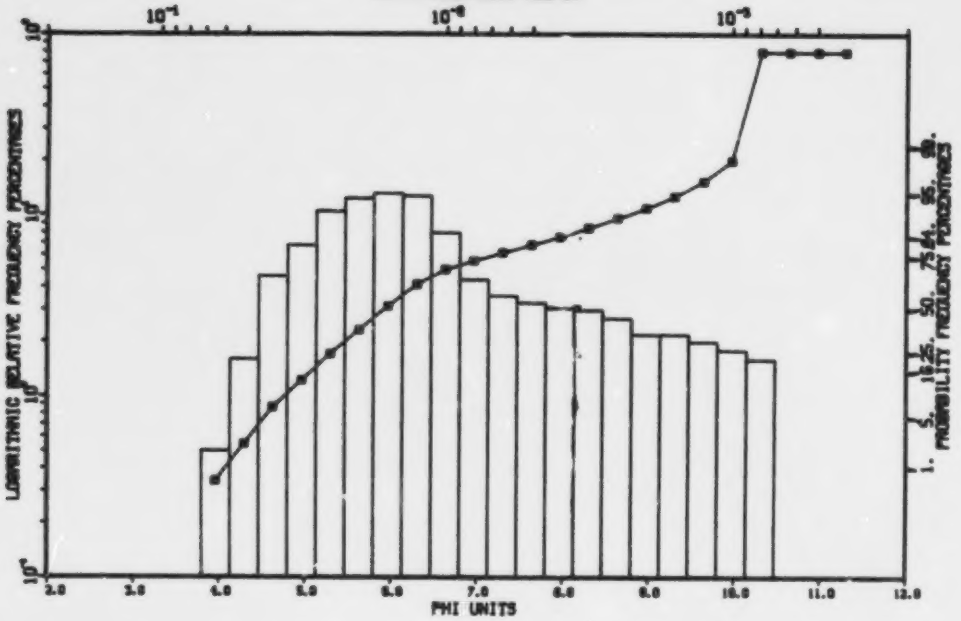


SAMPLE NO. - 556 J. SYVITSKI 8203433
IT2 10 ITERBILUNG FJORD

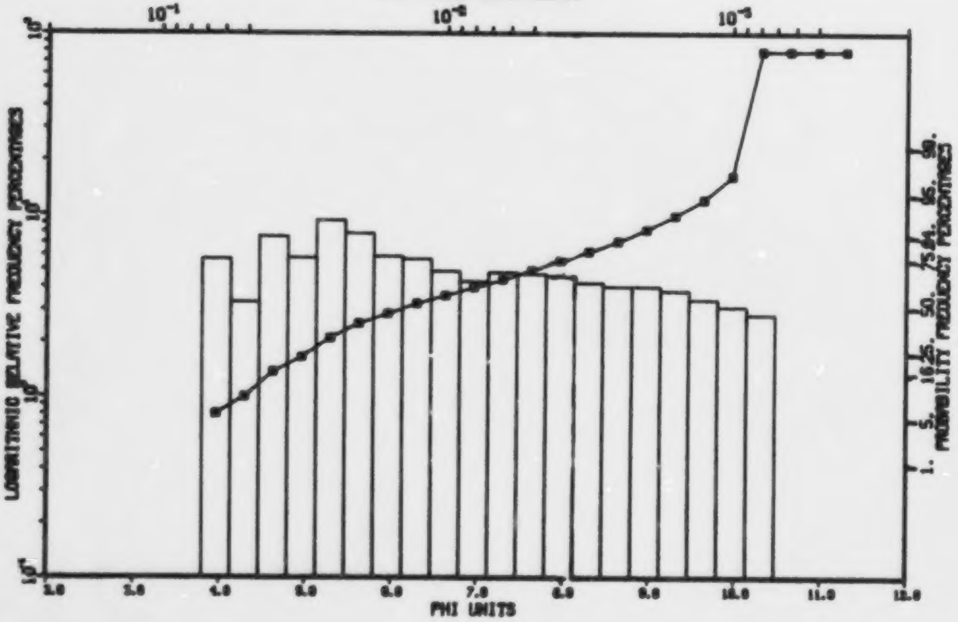


SAMPLE NO. - 557 J. SYVITSKI 8203432
IT2 20 ITERBILUNG FJORD

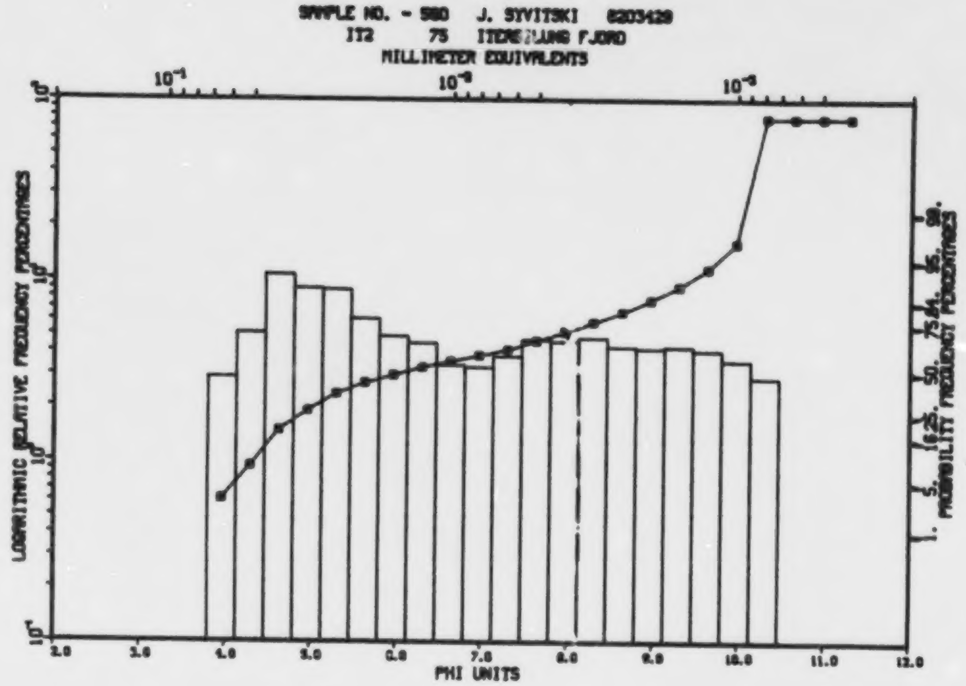




SAMPLE NO. - 550 J. SYVITSKI 8203431
IT2 30 ITERBILUNG FJORD



SAMPLE NO. - 550 J. SYVITSKI 8203430
IT2 50 ITERBILUNG FJORD


SAMPLE NO. - 580 J. SYVITSKI 8203428
IT2 75 ITERBILUNG FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
10^{2}
10^{1}
10^{0}
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1. 5. 16.25. 50. 75.84. 95. 99.
PROBABILITY FREQUENCY PERCENTAGES
2.0
3.0
4.0
5.0
6.0
7.0
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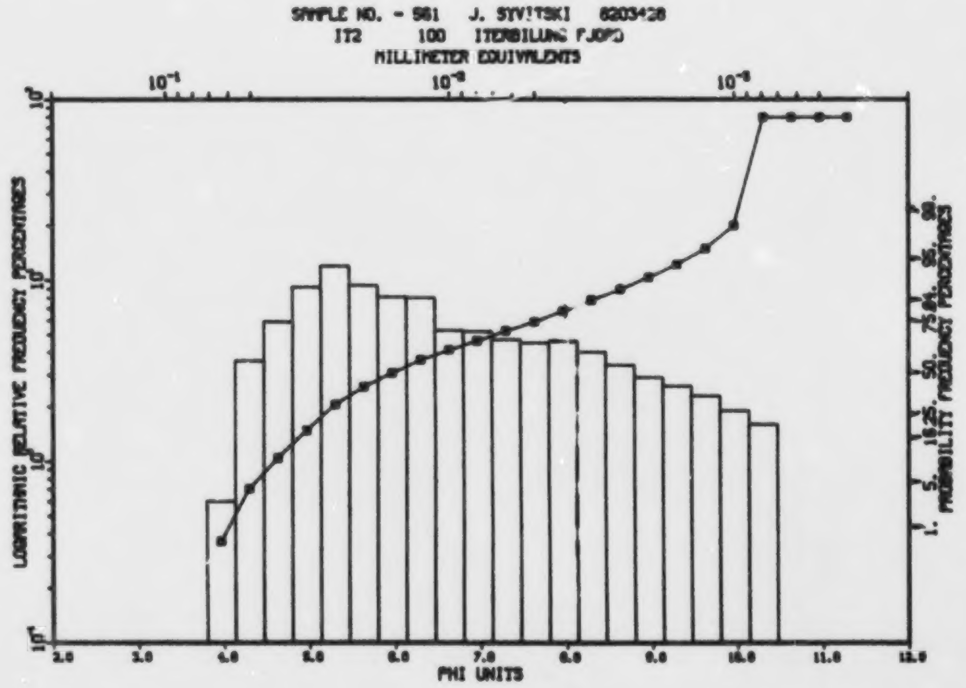
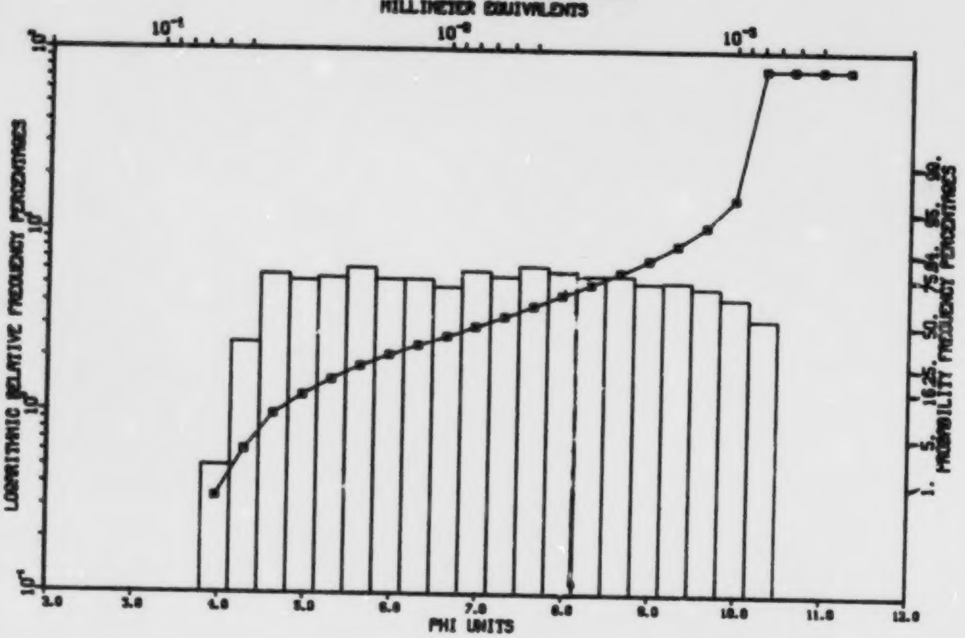
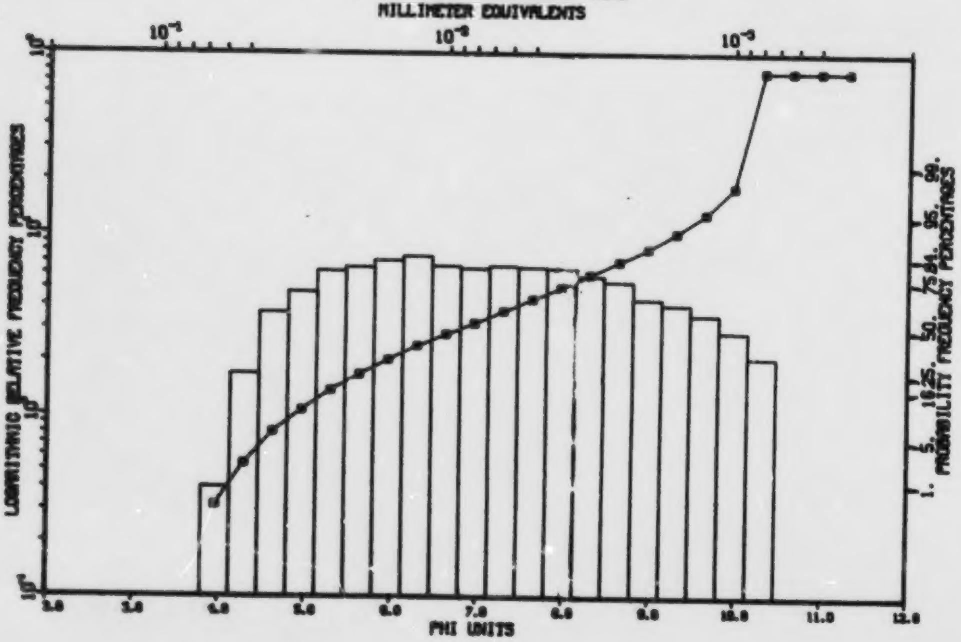
10.0
11.0
12.0
PHI UNITS


SAMPLE NO. - 581 J. SYVITSKI 8203428
IT2 100 ITERBILUNG FJORD
MILLIMETER EQUIVALENTS
10^{-1}
10^{-2}
10^{-3}
10^{2}
10^{1}
10^{0}
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1. 5. 16.25. 50. 75.84. 95. 99.
PROBABILITY FREQUENCY PERCENTAGES
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

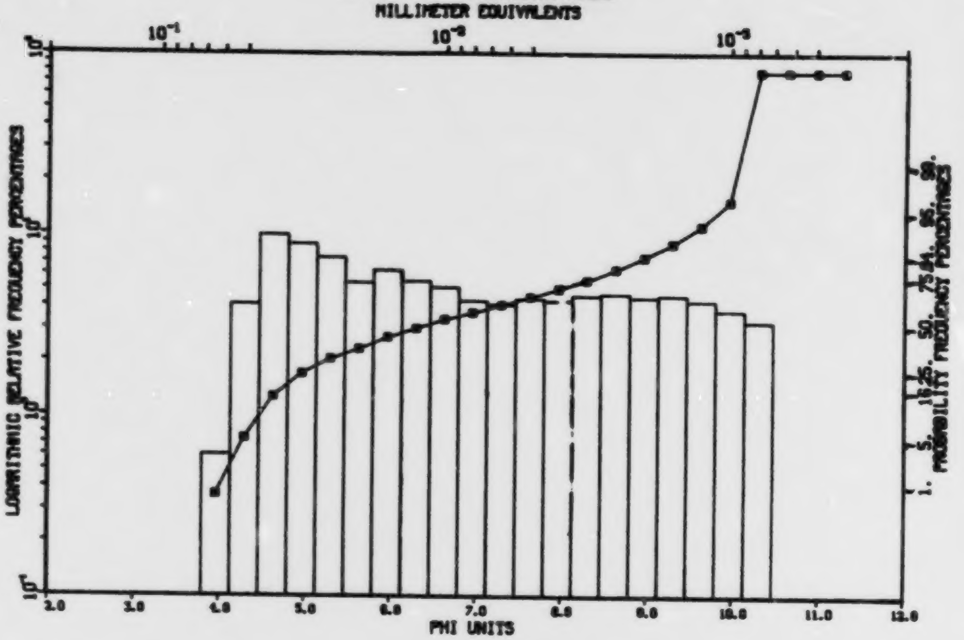
SAMPLE NO. - 562 J. SYVITSKI 8203427
IT2 300 ITERBILUNG FJORD



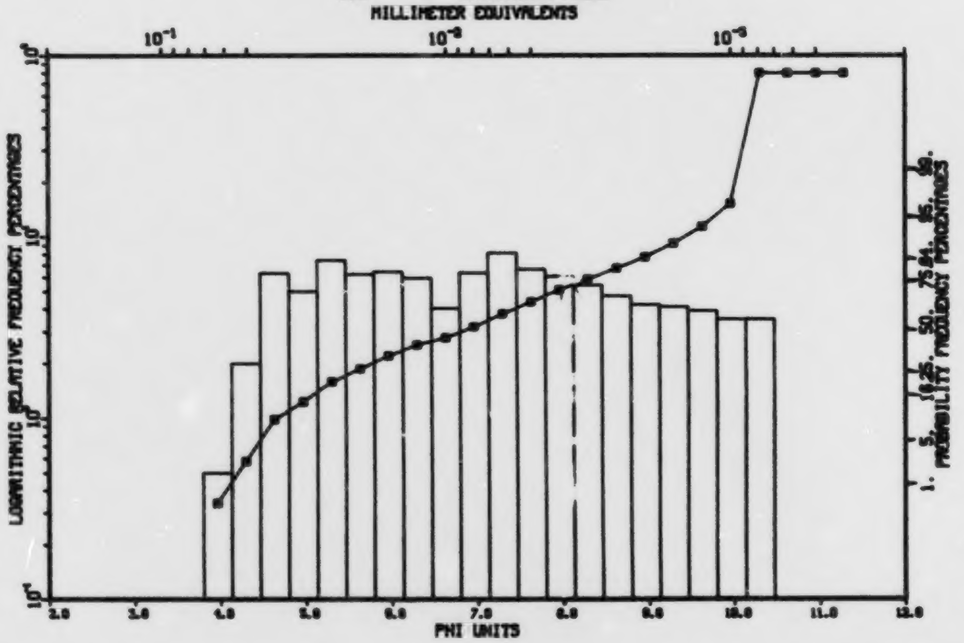
SAMPLE NO. - 563 J. SYVITSKI 8203428
IT2 305 ITERBILUNG FJORD



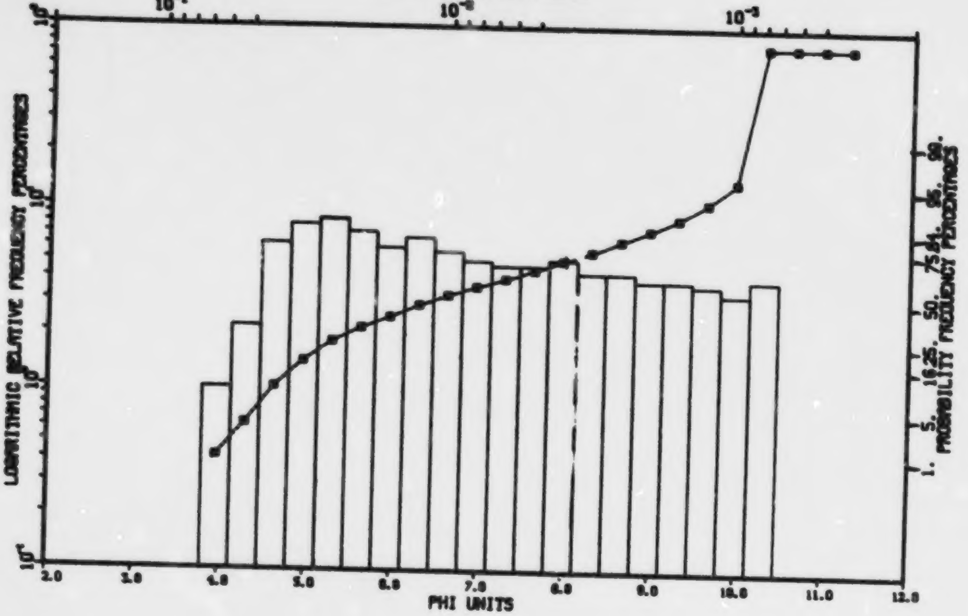
SAMPLE NO. - 584 J. SYVITSKI 8203445
IT3 1 ITERBILUNG FJORD



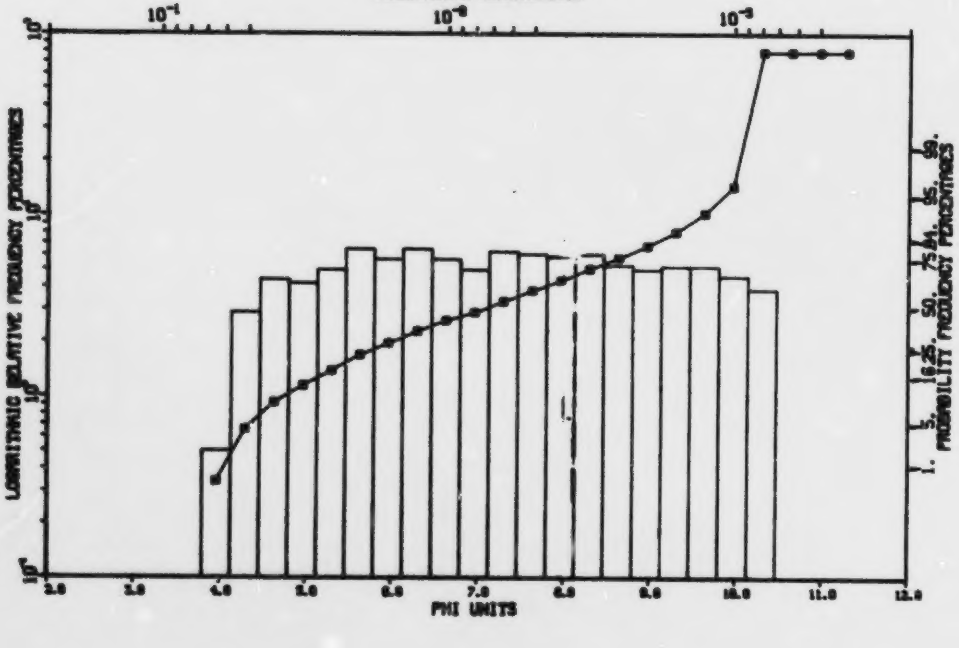
SAMPLE NO. - 585 J. SYVITSKI 8203444
IT3 5 ITERBILUNG FJORD



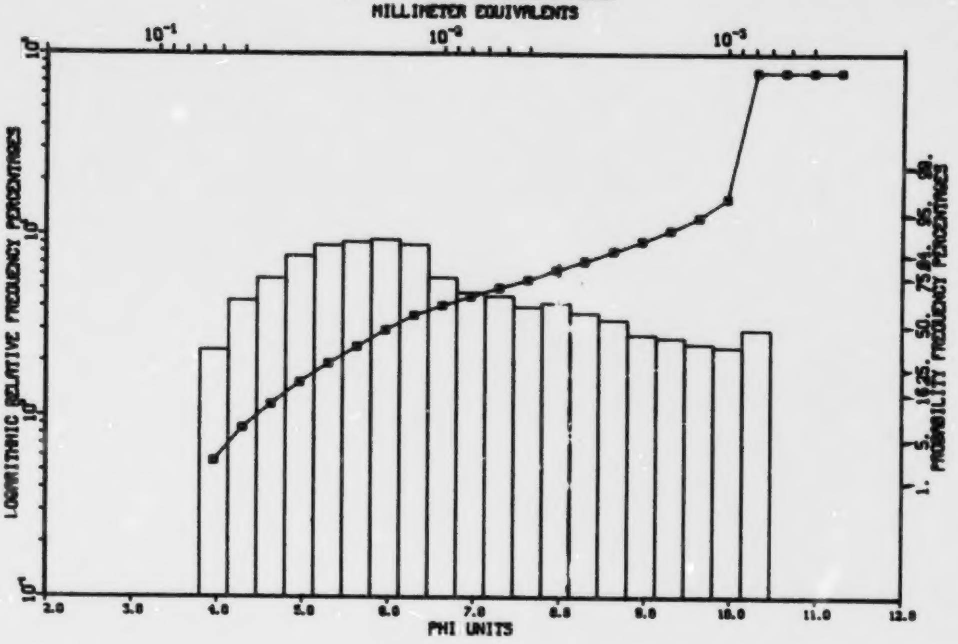
SAMPLE NO. - 586 J. SYVITSKI 8203443
IT3 10 ITERBILUNG FJORD
MILLIMETER EQUIVALENTS



SAMPLE NO. - 587 J. SYVITSKI 8203442
IT3 20 ITERBILUNG FJORD
MILLIMETER EQUIVALENTS



SAMPLE NO. - 588 J. SYVITSKI 8203441
IT3 30 ITERBILUNG FJORD



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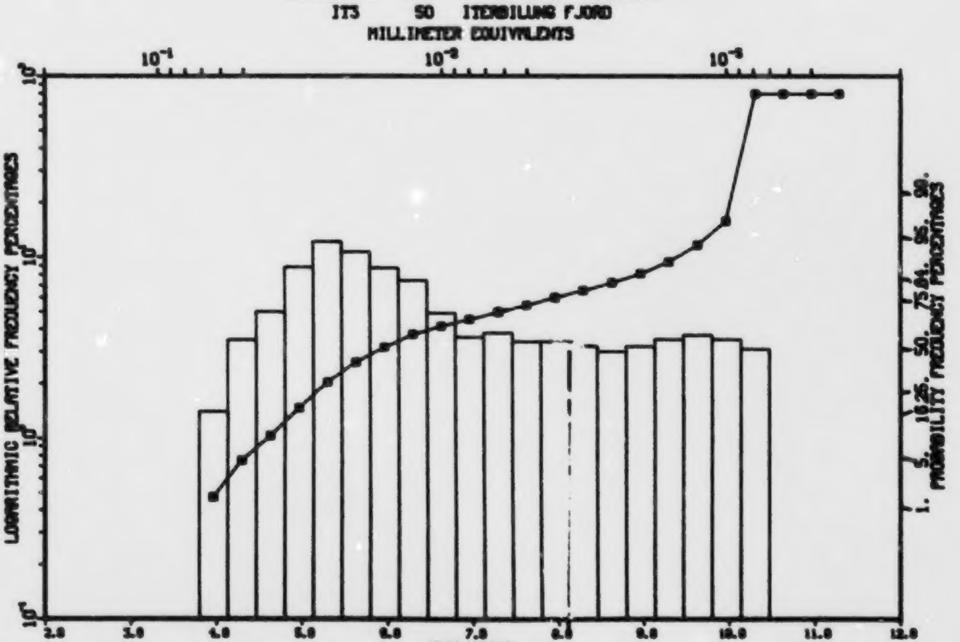

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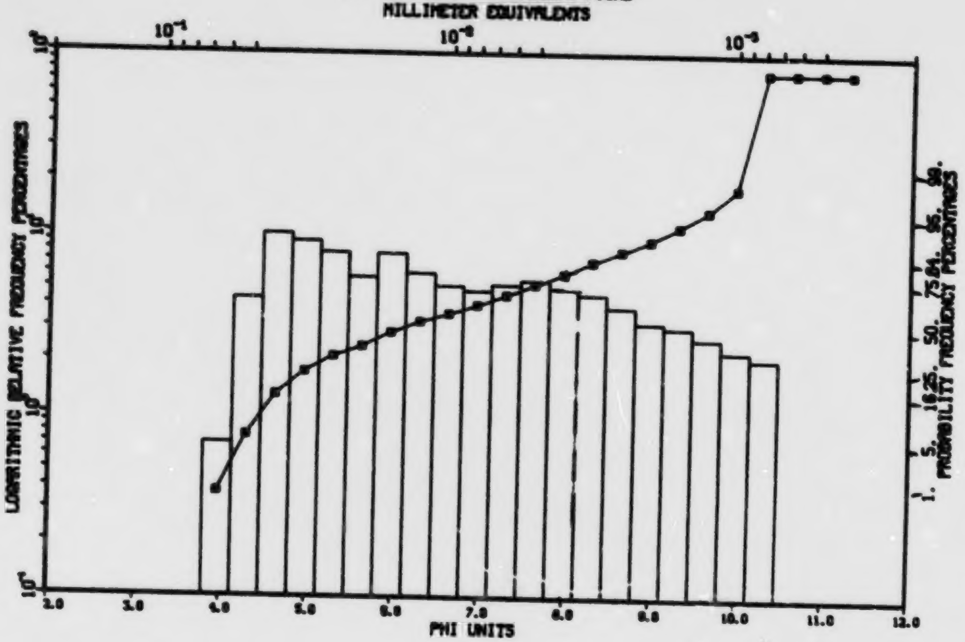

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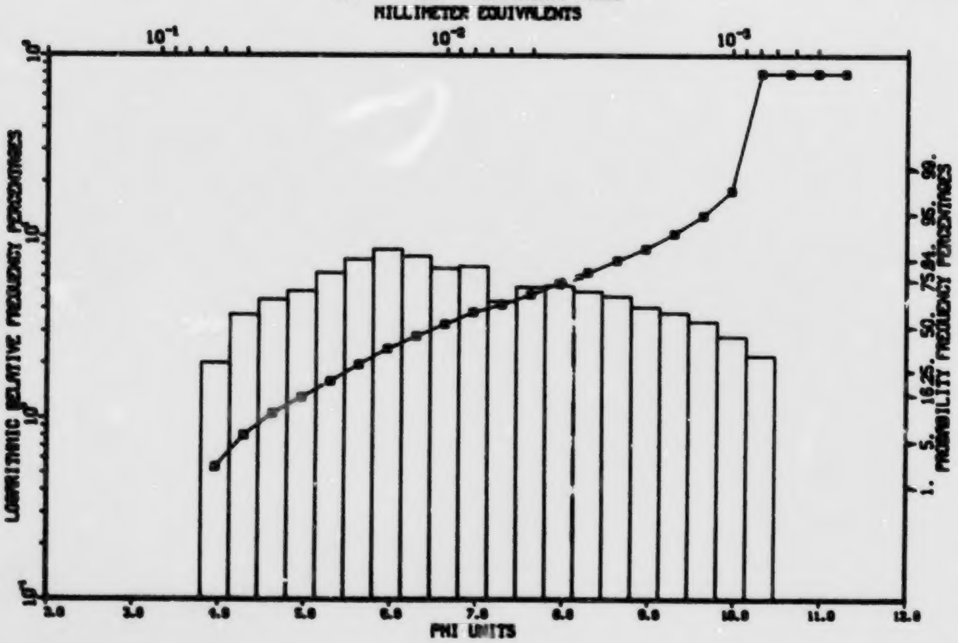

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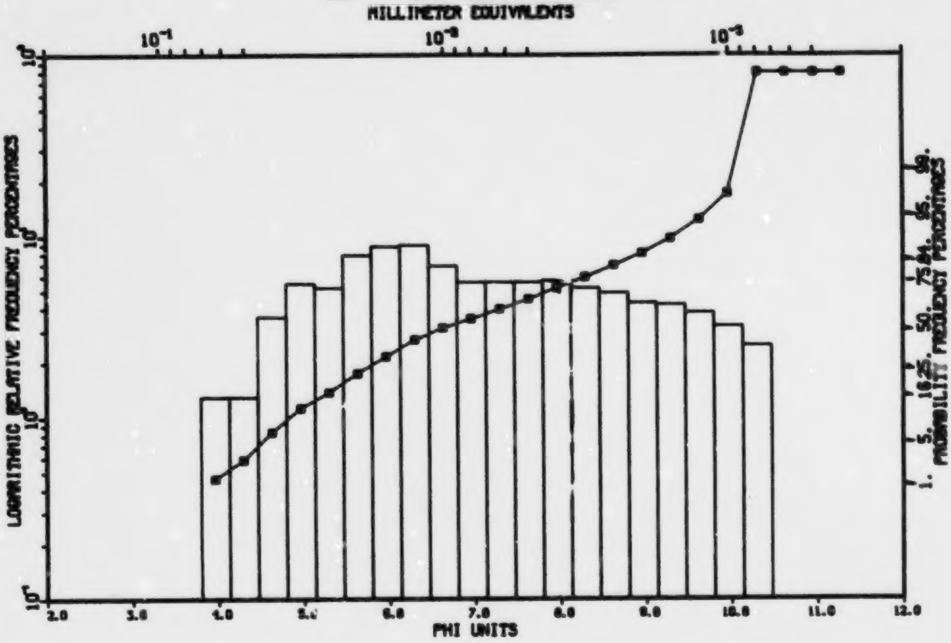

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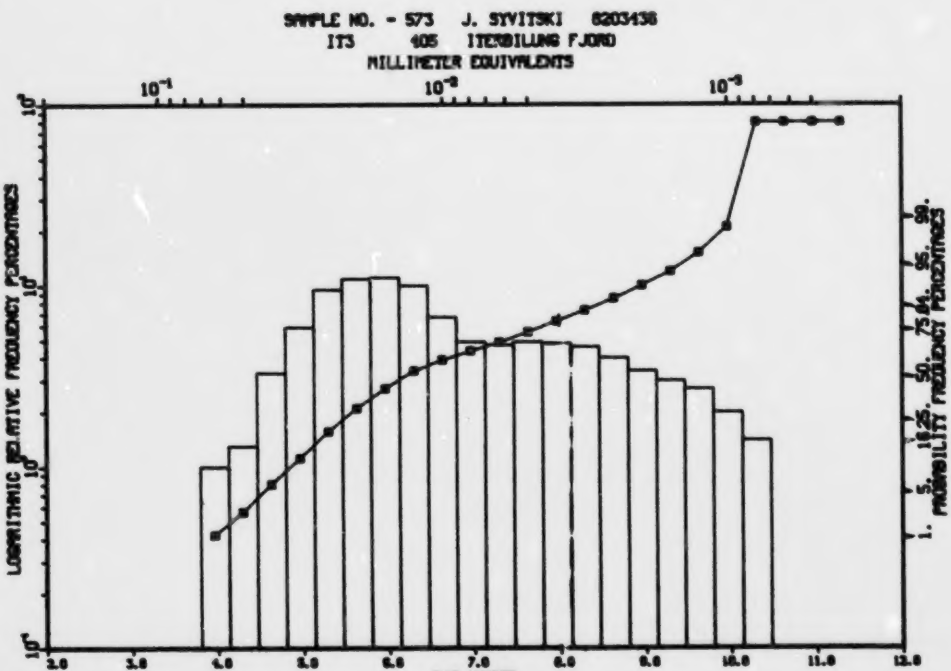

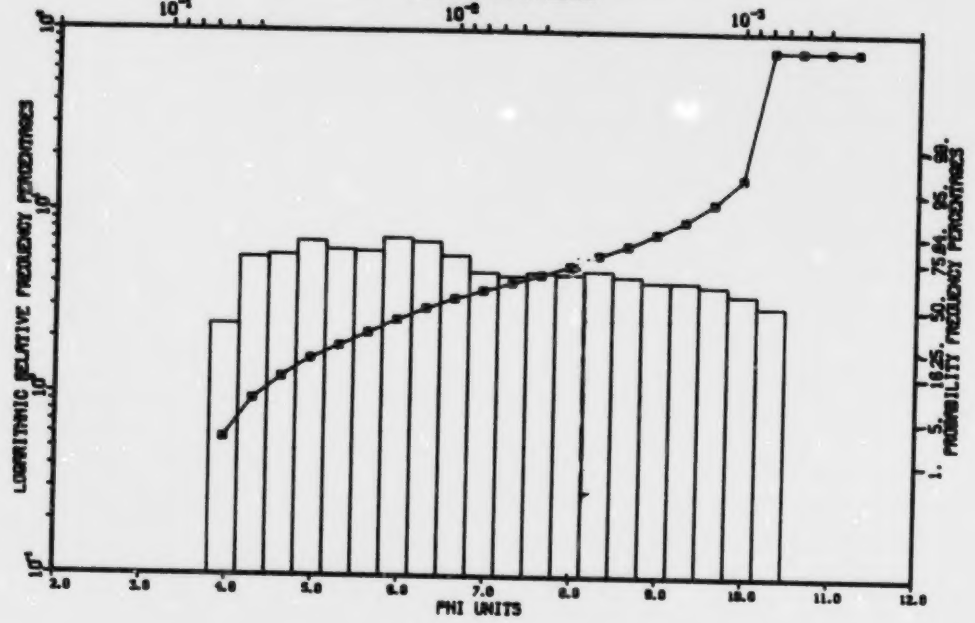

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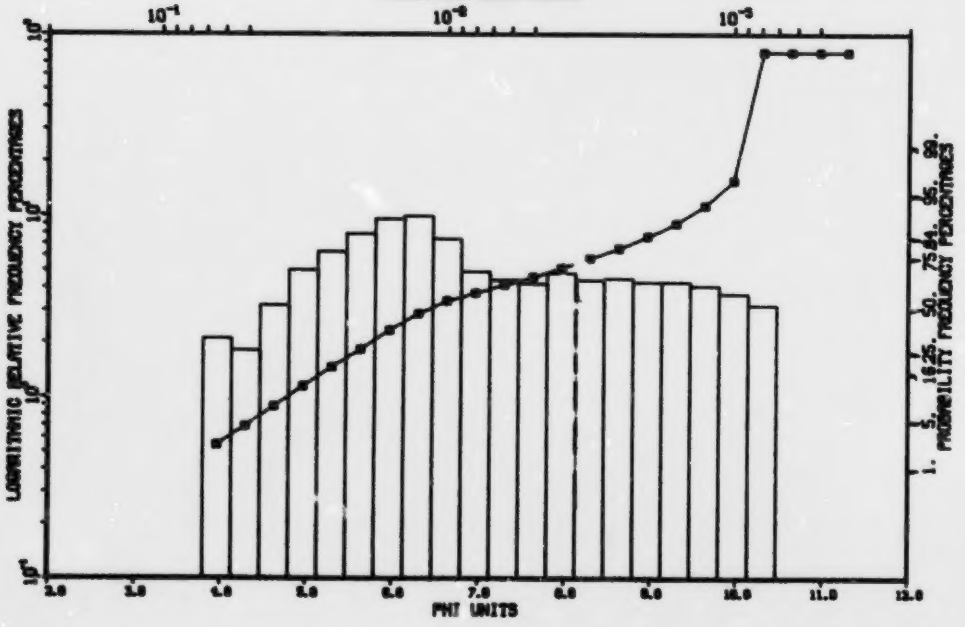

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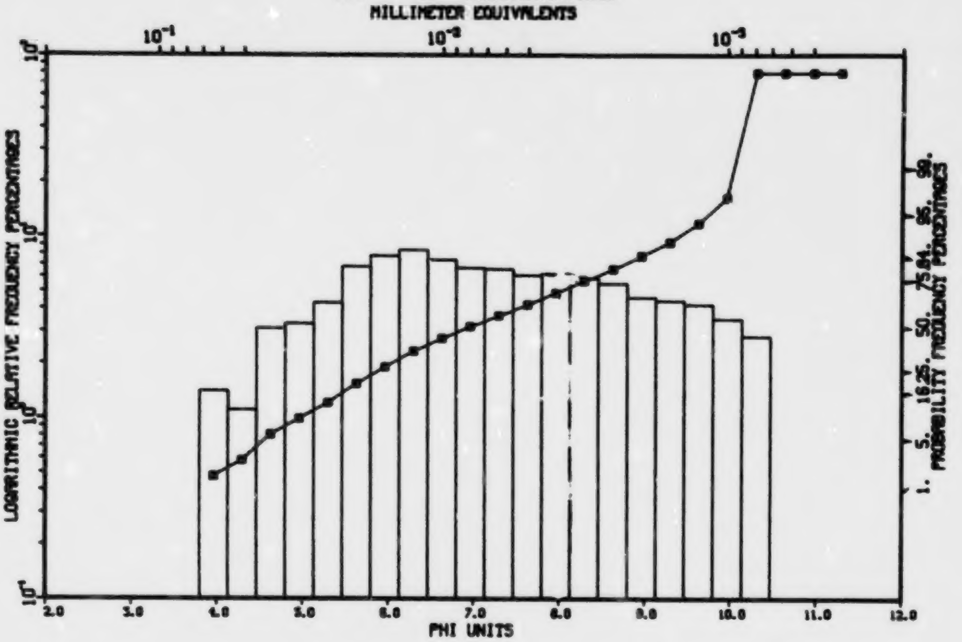

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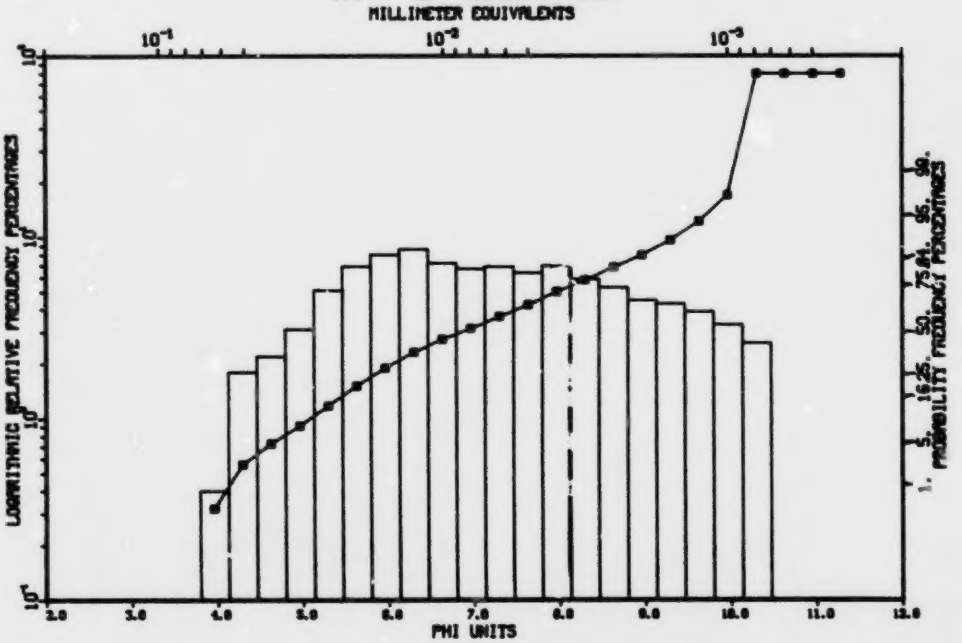

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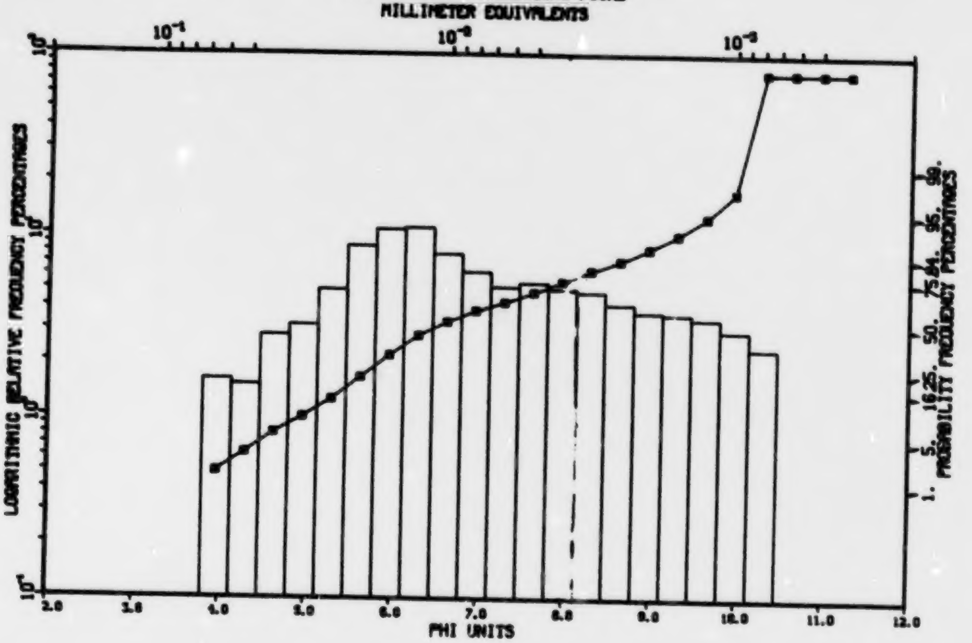

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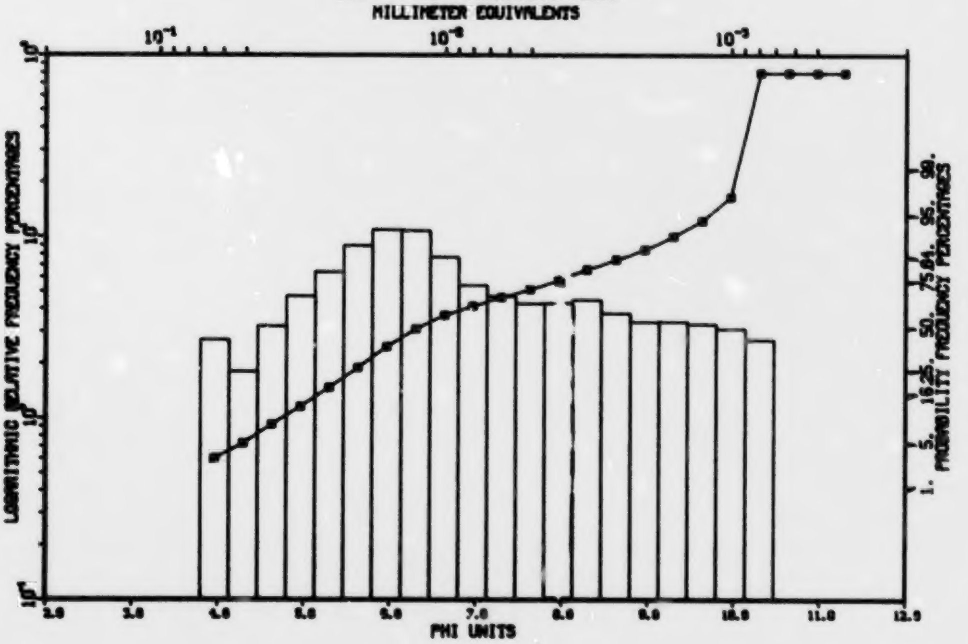

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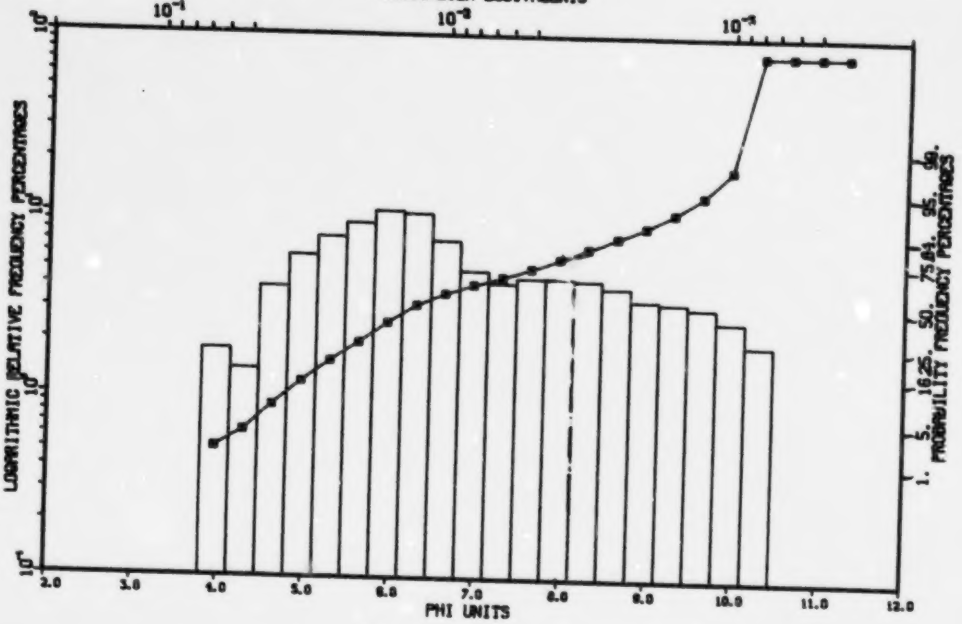

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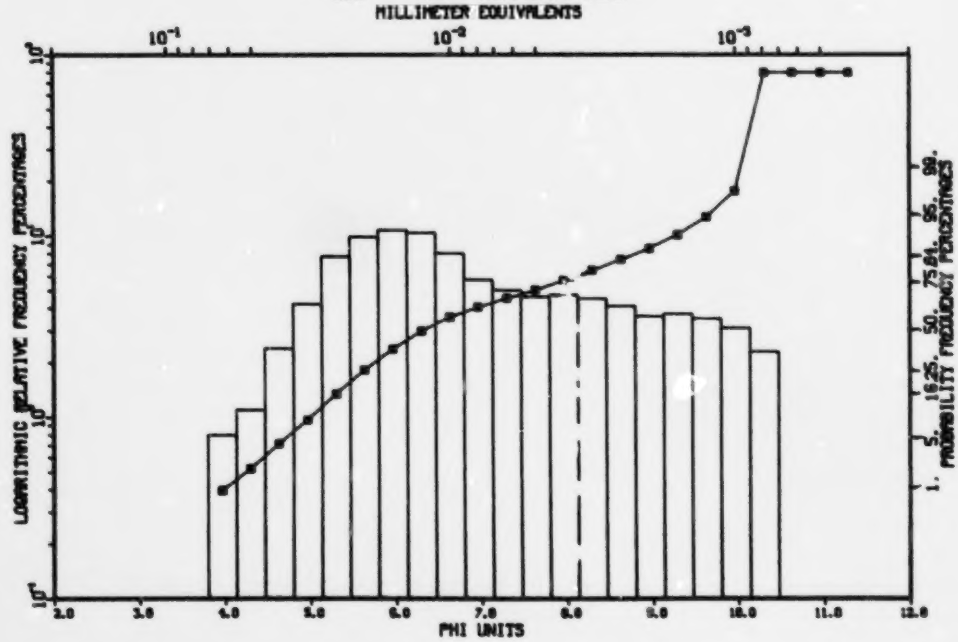

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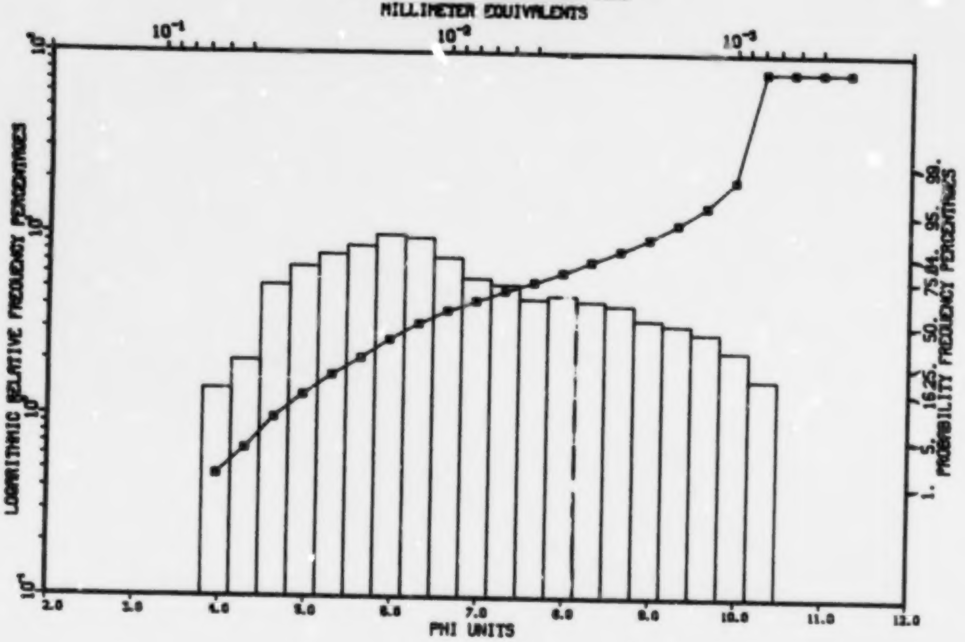

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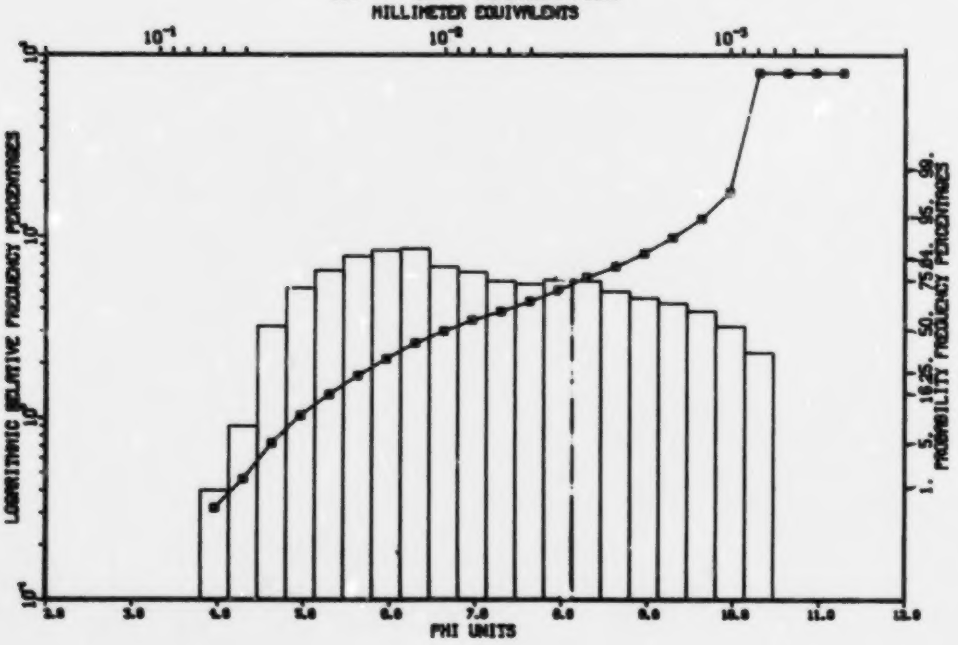

SAFE: 1983 CAMBRIDGE FIORD SUBMARINE SPRING EXPERIMENT

by

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CRUISE OBJECTIVES

A) To obtain both vertical and horizontal profiles of salinity, temperature and vertical velocity within and to the side of the buoyant plume.

B) To obtain quantitative measurements of acoustic backscatter from the ascending plume.

C) To use these measurements as the basis for: (1) estimates of water properties and fluxes at the point of discharge, (2) studies of the plume dynamics, and (3) studies of the acoustic backscatter mechanism(s).

METHODS

Observations were made from the scientific launch GREBE while four-point moored over the vent. Measurements were made with a 200 kHz Ross Laboratories portable acoustic sounder (Hay, 1983), a Guildline Model 8770 portable CSTD, and a Neil Brown Instrument Systems DRCM-2 acoustic current meter. The analog acoustic signals were recorded on a RACAL Store-4 DS instrumentation tape recorder. Vertical CTD profiles were obtained in the usual way, although typical rates of ascent and descent were 25-30 cm s^{-1}. These slow rates were used in order to resolve the fine structure in the plume. Horizontal CTD profiles were obtained with the probe in its normal orientation but moved horizontally while at constant depth using a pulley system integral to one of the mooring lines. Measurements were made for 1-2 min intervals at probe positions separated by 1 m. Vertical velocities were obtained with the current meter mounted in a horizontal orientation on a lead-ballasted frame. The EPROM's in the deck unit were programmed to generate the horizontal and vertical components of the measured current.

The CTD data have undergone several levels of processing. First, the pressure time-series for each cast was recomputed by performing a sliding 15-point least squares fit to a second-order polynomial. This eliminated small amplitude random changes in pressure arising from the low resolution (0.12 dbar) and noise in the least significant bit of the pressure word, and the slow speed of the probe. The improvement can be seen by comparing the profiles presented here to those in Hay (1984), which were based on the raw pressure data. Second, segments of the T and C time-series exhibiting pronounced fine structure were high-pass filtered and cross-correlated. The high-pass filter had a cutoff frequency of 0.5 Hz. The cross-correlations between conductivity and temperature had maxima for small lags at a lag of +1 sample interval for downcasts, and -1 sample interval for upcasts. (The details of these results are not presented here, but are available upon request). On this basis, salinity and σ_t were recomputed using the UNESCO 1978 practical salinity scale after shifting the temperature and conductivity time series' by one point with respect to each other.

RESULTS

The data collected are summarized in Table 5-1. Acoustic backscatter data were acquired in conjunction with the vertical CTD profiles and the profiles of vertical velocity. Several time-series' of C, T and D were recorded with the CTD maintained at a fixed depth. These are listed in Table 5-1 as flat segments of a CTD cast, and the depths given.

Vertical profiles of T, S and σ_t, computed from the shifted T and C time-series', are given in Figs. 5-1 to 5-6. (Note that the σ_t profile is identified by ST). TS diagrams corresponding to some of these profiles are presented in Figs. 5-7 to 5-13, in each of which the TS diagram on the left is based on the original salinities and that on the right on salinities computed after applying the shift. In both cases the T and S data were smoothed with a 3-pass, 5-point running average. Even after smoothing pronounced loops are present in the TS diagrams, indicative of the inhomogeneous nature of the turbulent plume. The TS plots of the shifted data, however, exhibit a marked reduction in the amplitudes of the salinity variations in these loops.

The profiles of vertical velocity are presented in Fig. 5-14. An offset of about -3 cm s^{-1} exists in these profiles, which are based on 1-2 min averages at 5 m intervals.

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RESULTS TO FOLLOW

Further analysis of the CTD data will be performed, the objectives being: (1) to better define the mixing curves; and (2) to produce temperature fluctuation spectra. Digital processing of the tape recorded acoustic backscatter data is being initiated.

ACKNOWLEDGEMENT

We thank W. M. Petrie for his efforts in providing us with the raw CTD data.

Table 5-1. Summary of data collected at the submarine spring station CAIS. Times are Atlantic Daylight Time (ADT). SEQ represents the sequential cast number.

(a) Vertical CTD profiles

DATE	SEQ.	TIME	DOWN	FLAT	UP
21/09/83	1	1357	x		x
	2	1411	x		x
	3	1420	x		x
	4	1445	x		x
	5	1451	x		x
	6	1459	x		
	7	1555	x	39.4 m	x
	8	1600	x		x
22/09/83	10	1013	x		
	11	1225	x		x
	12	1232	x		x
	13	1245		24.5 m	
	14	1315		24.5 m	

(b) Horizontal CTD profiles

DATE	SEQ.	TIME	DEPTH(m)	WIDTH (m)
21/09/83	1	N/A	33	15
	2	N/A	33	20
	3	N/A	43	18
22/09/83	4	N/A	29	23

(c) Vertical Velocity profiles

DATE	SEQ.	TIME	DOWN	UP
22/09/83	1	1511-1542	x	x
	2	1549-1605	x	

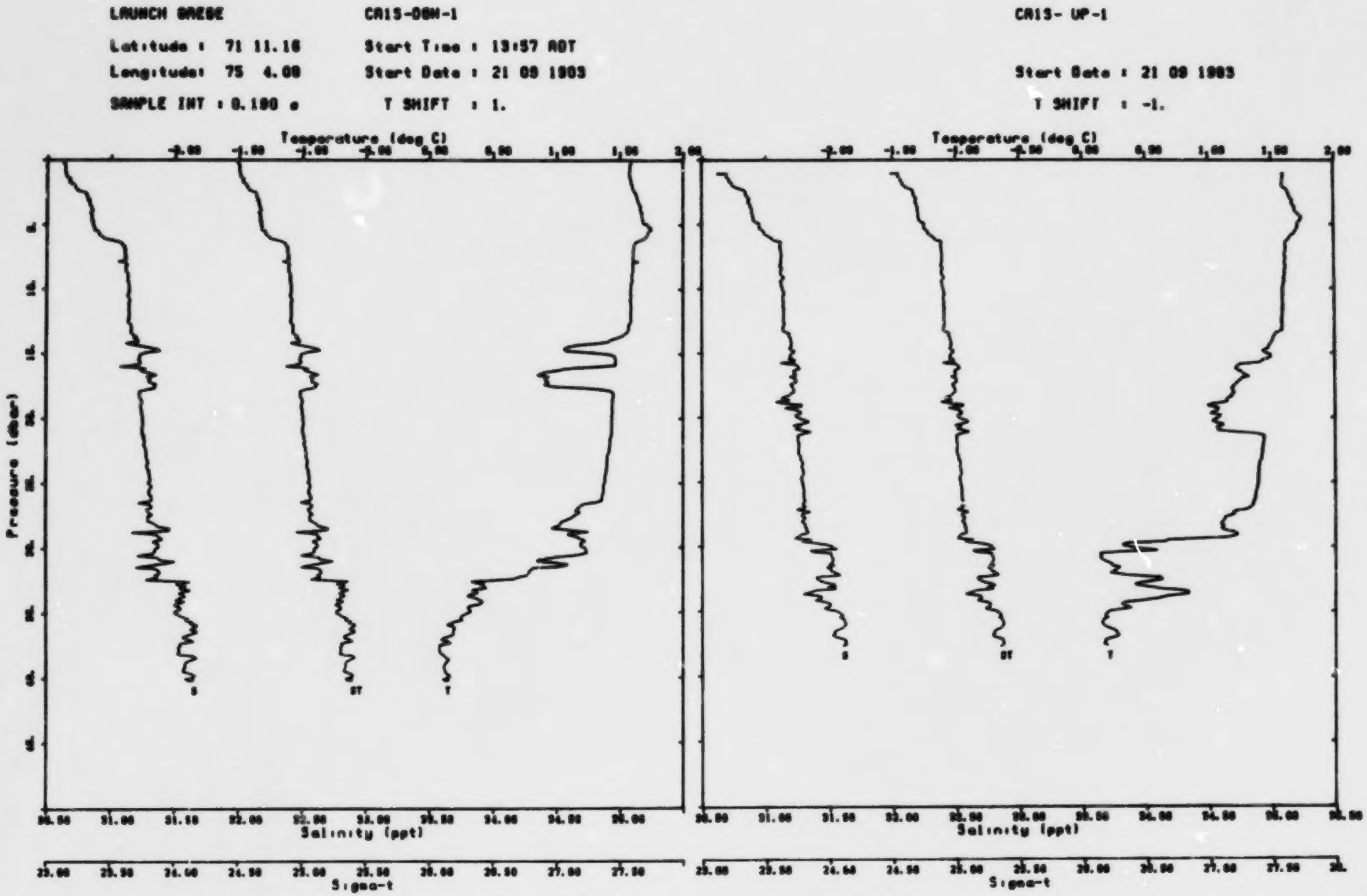


Figure 5-1. CTD profiles, sequential cast 1.

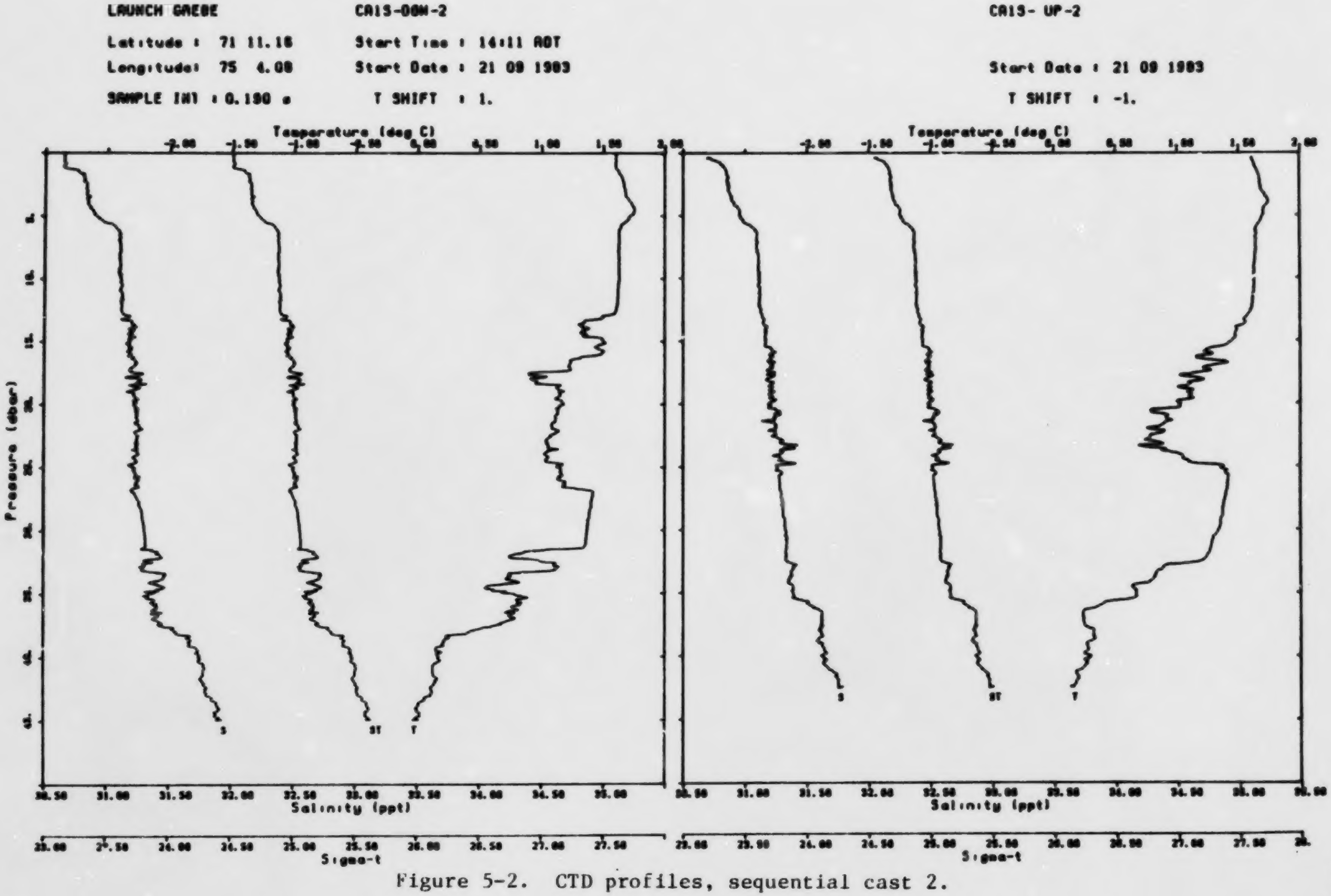


Figure 5-2. CTD profiles, sequential cast 2.

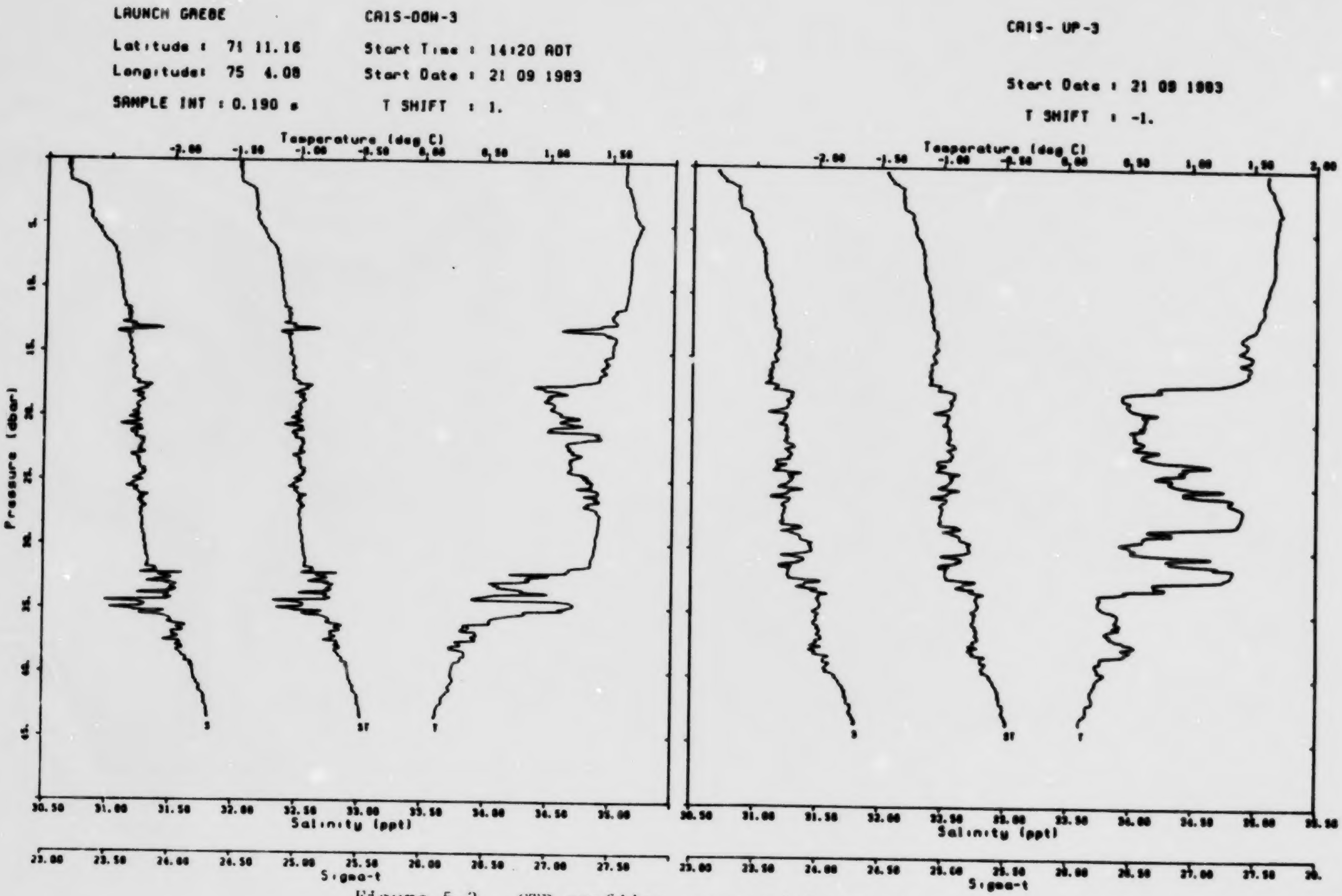


Figure 5-3. CTD profiles, sequential cast 3.

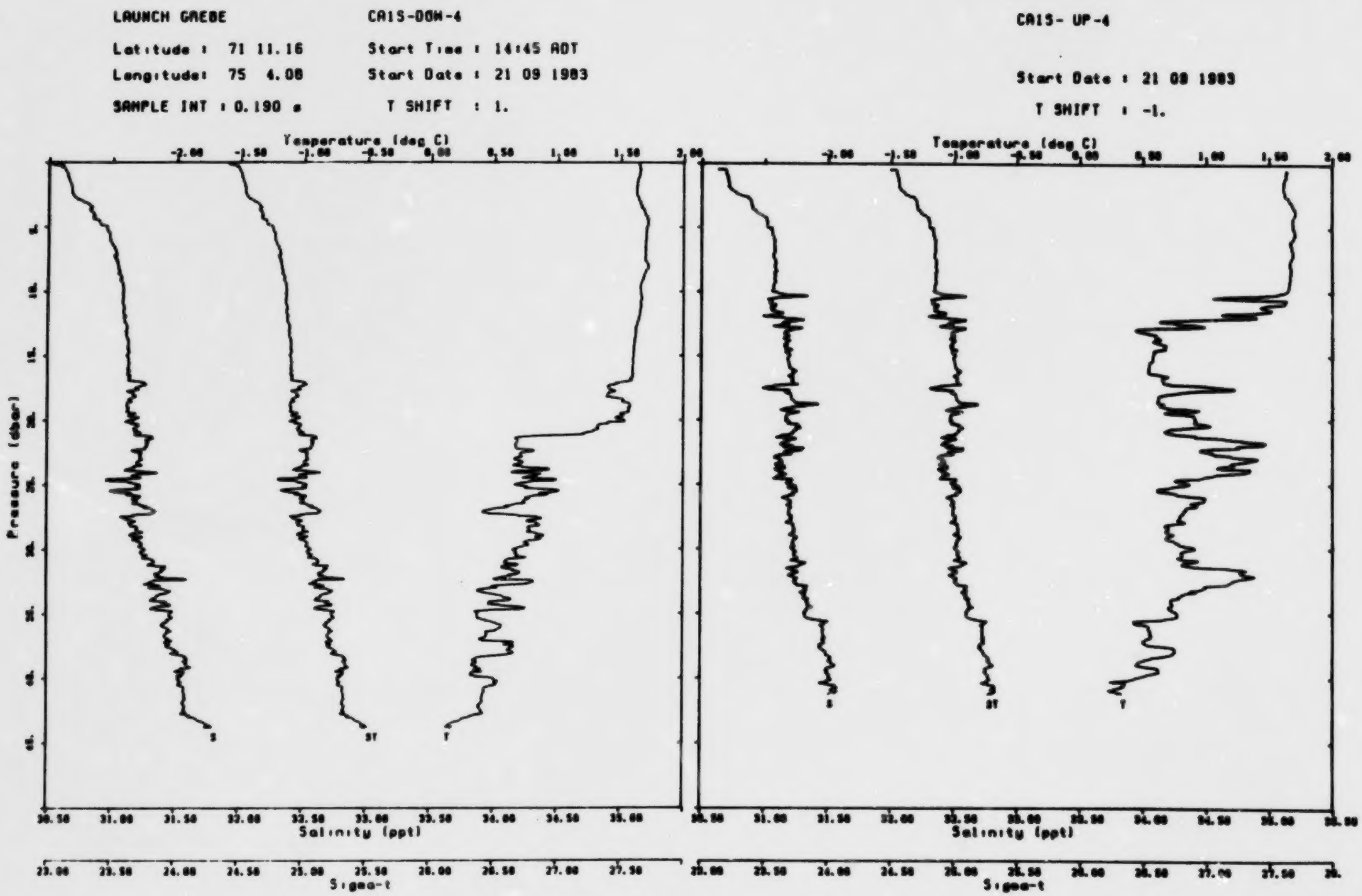


Figure 5-4. CTD profiles, sequential cast 4.

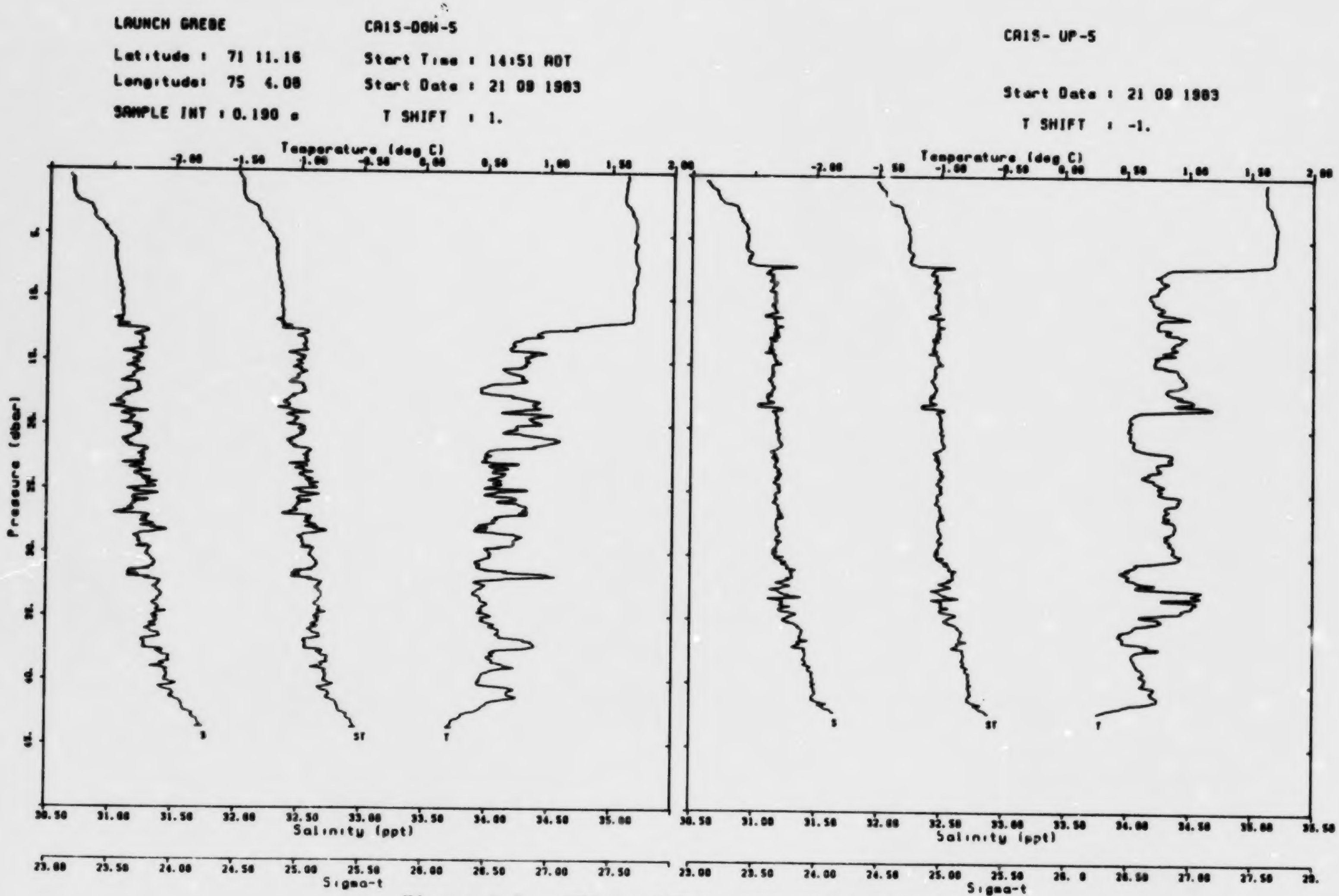


Figure 5-5. CTD profiles, sequential cast 5.

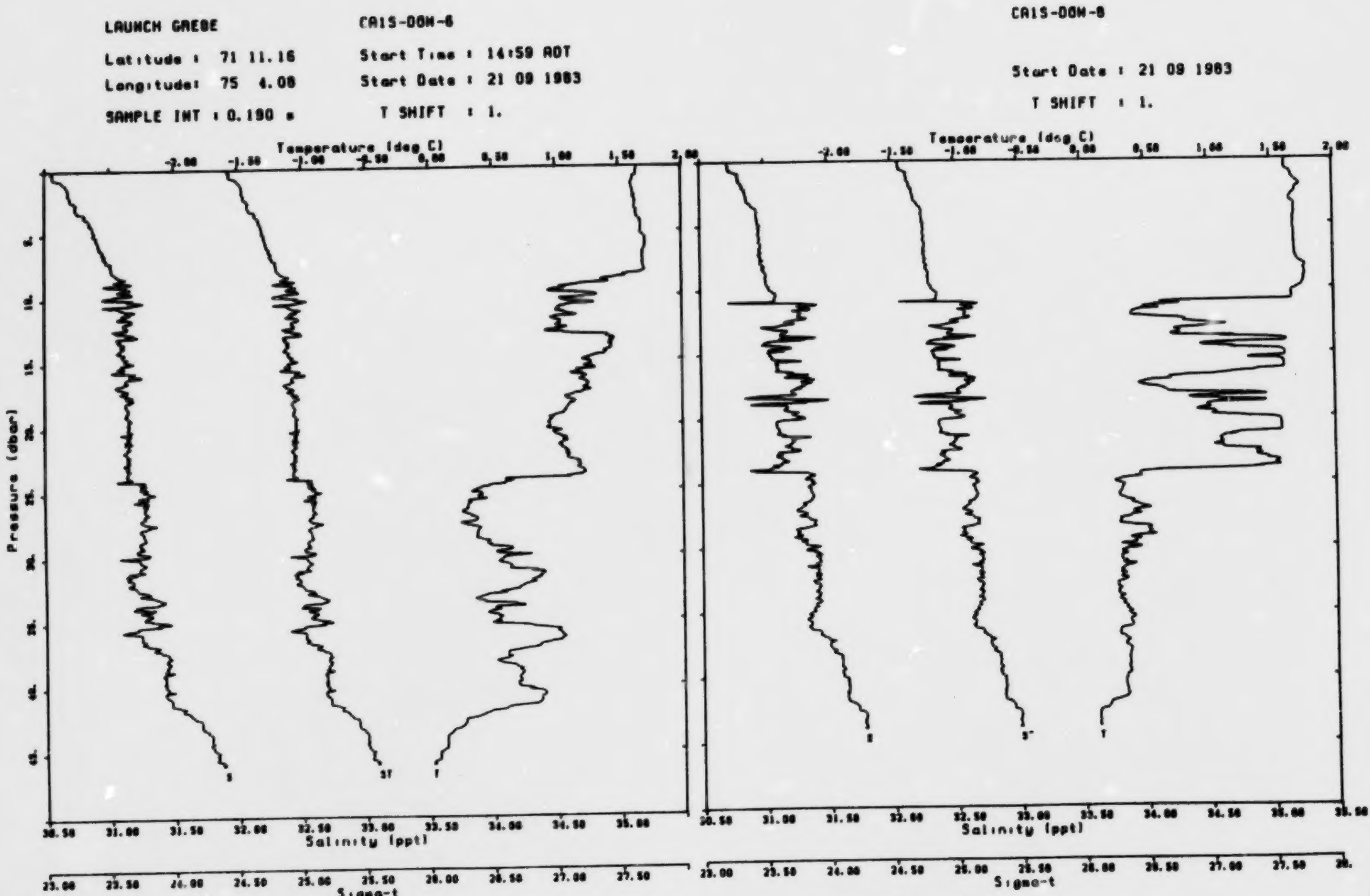
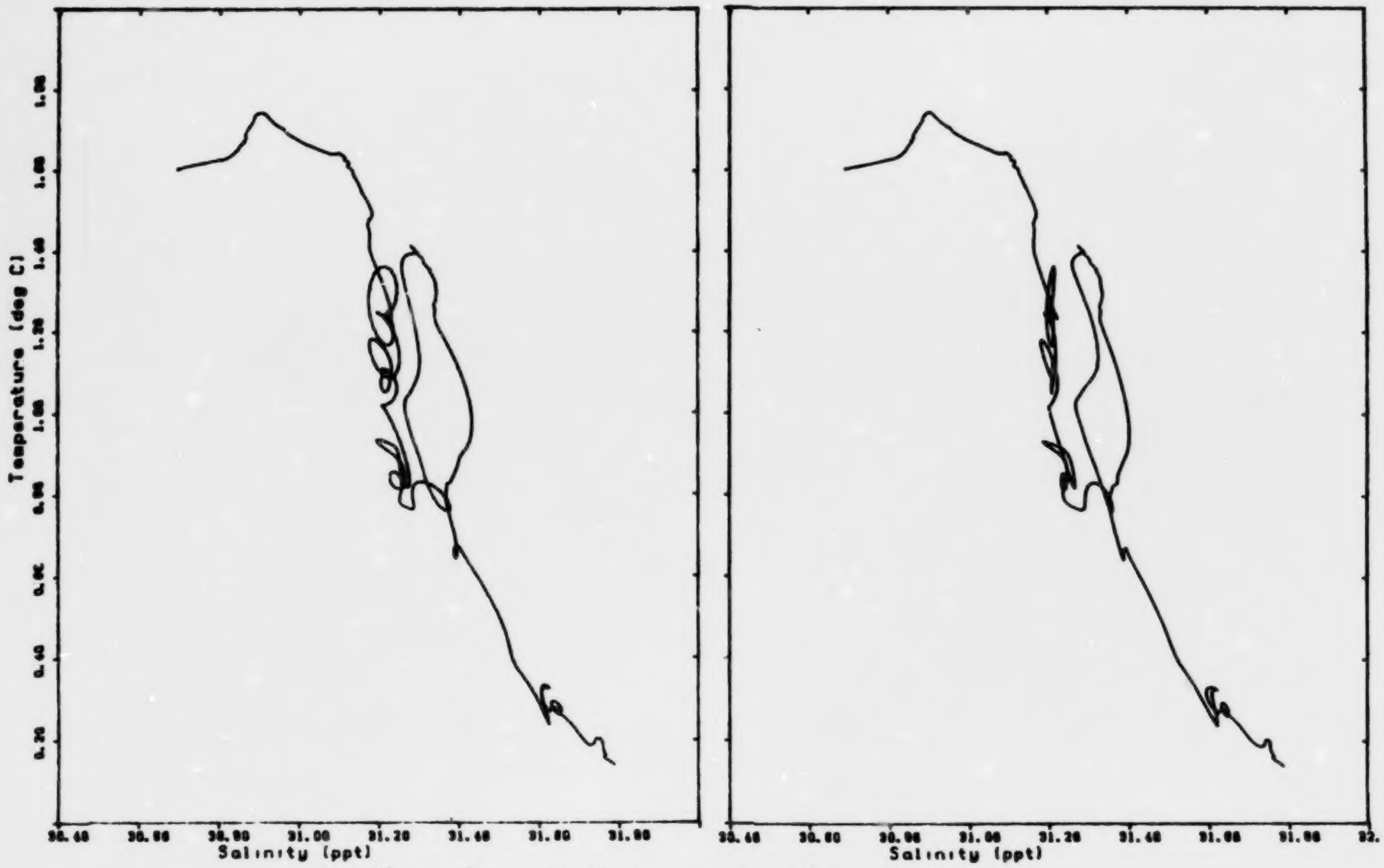


Figure 5-6. CTD profiles, sequential casts 6 and 8.



CAIS- UP-2

Start Time : 14:11 ADT

Start Date : 21 09 1983

T SHIFT : -1.

Figure 5-7. TS diagrams, sequential cast 2, up.

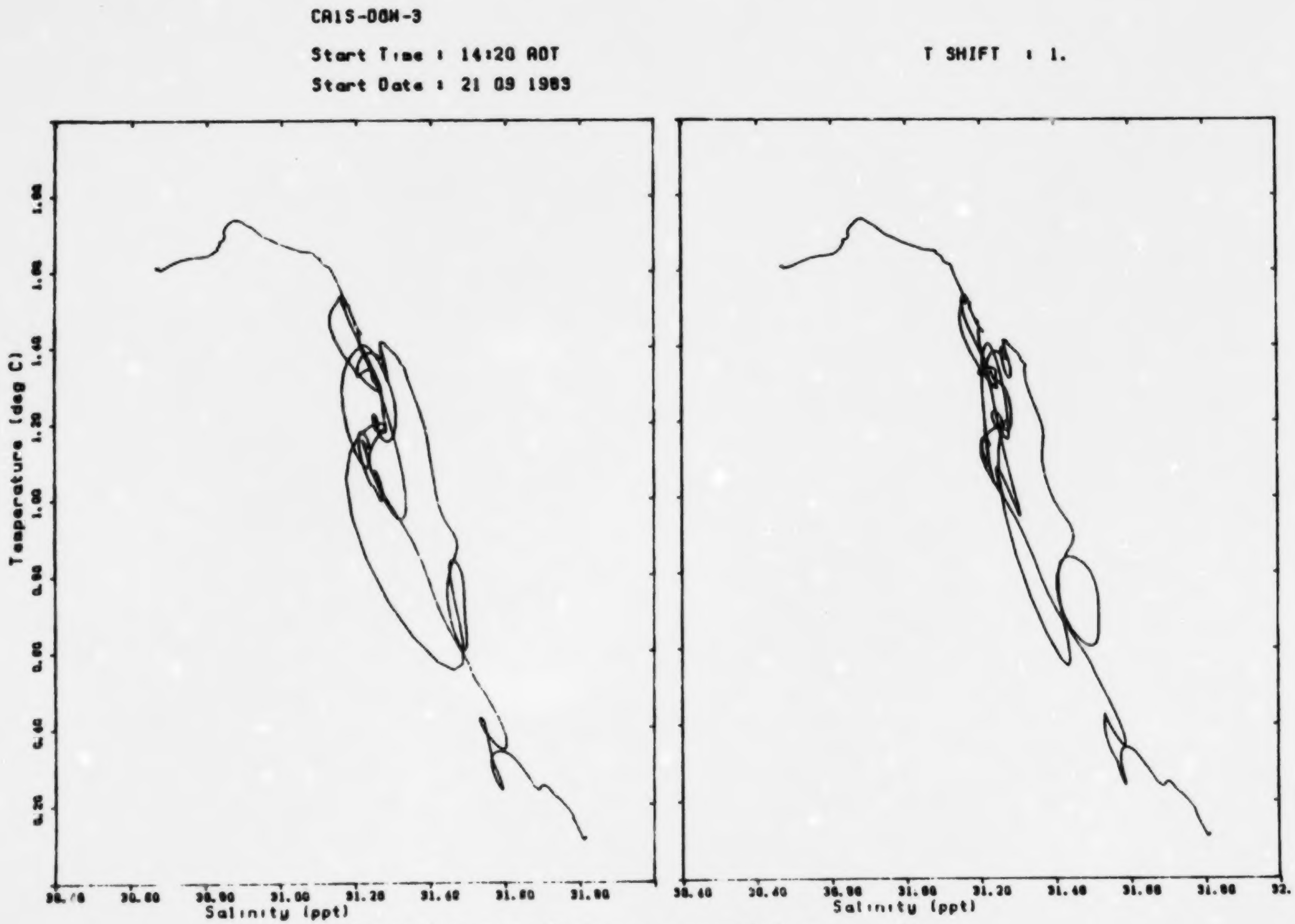


Figure 5-8. TS diagrams, sequential cast 3, down.

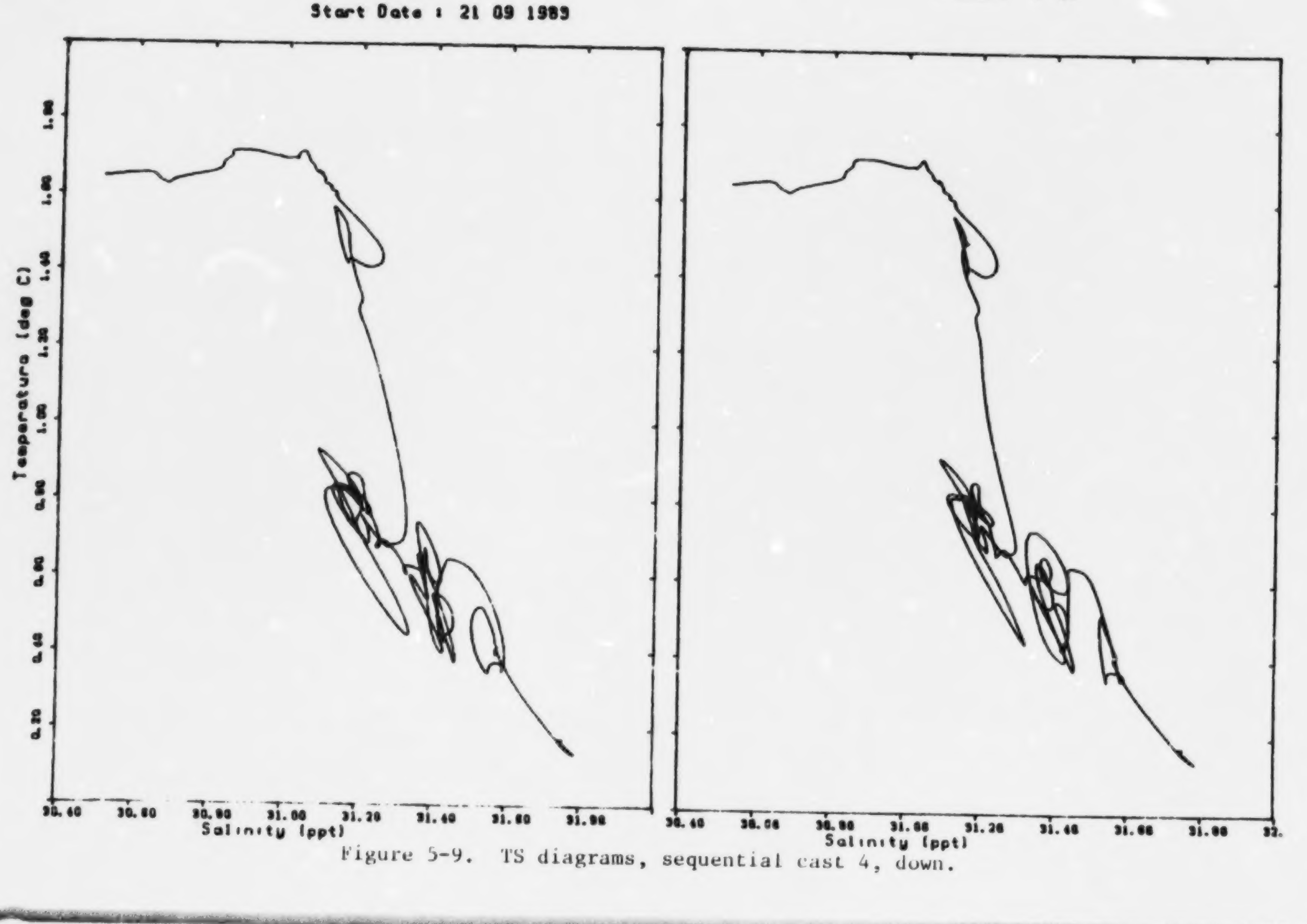


Figure 5-9. TS diagrams, sequential cast 4, down.

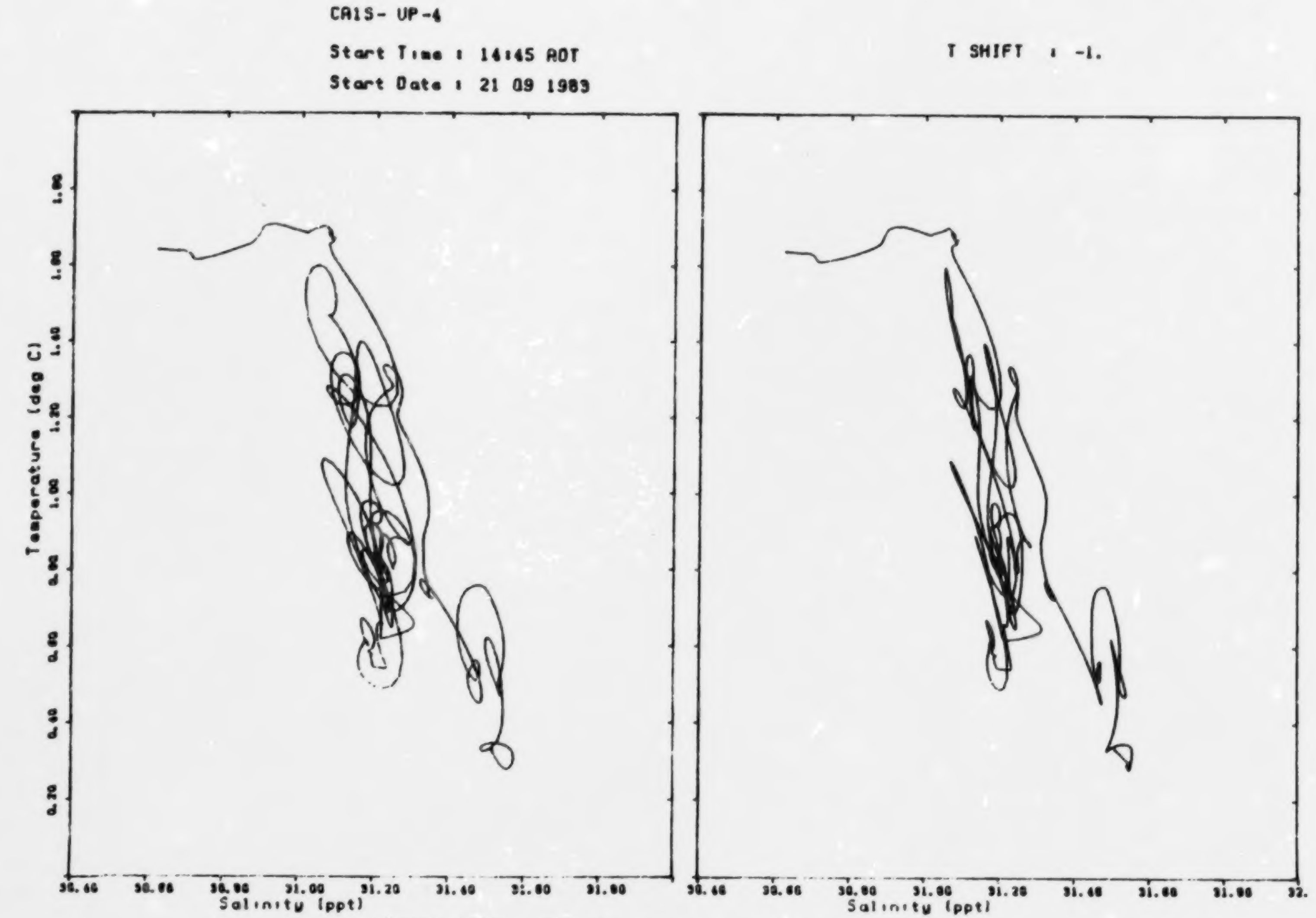


Figure 5-10. TS diagrams, sequential cast 4, up.

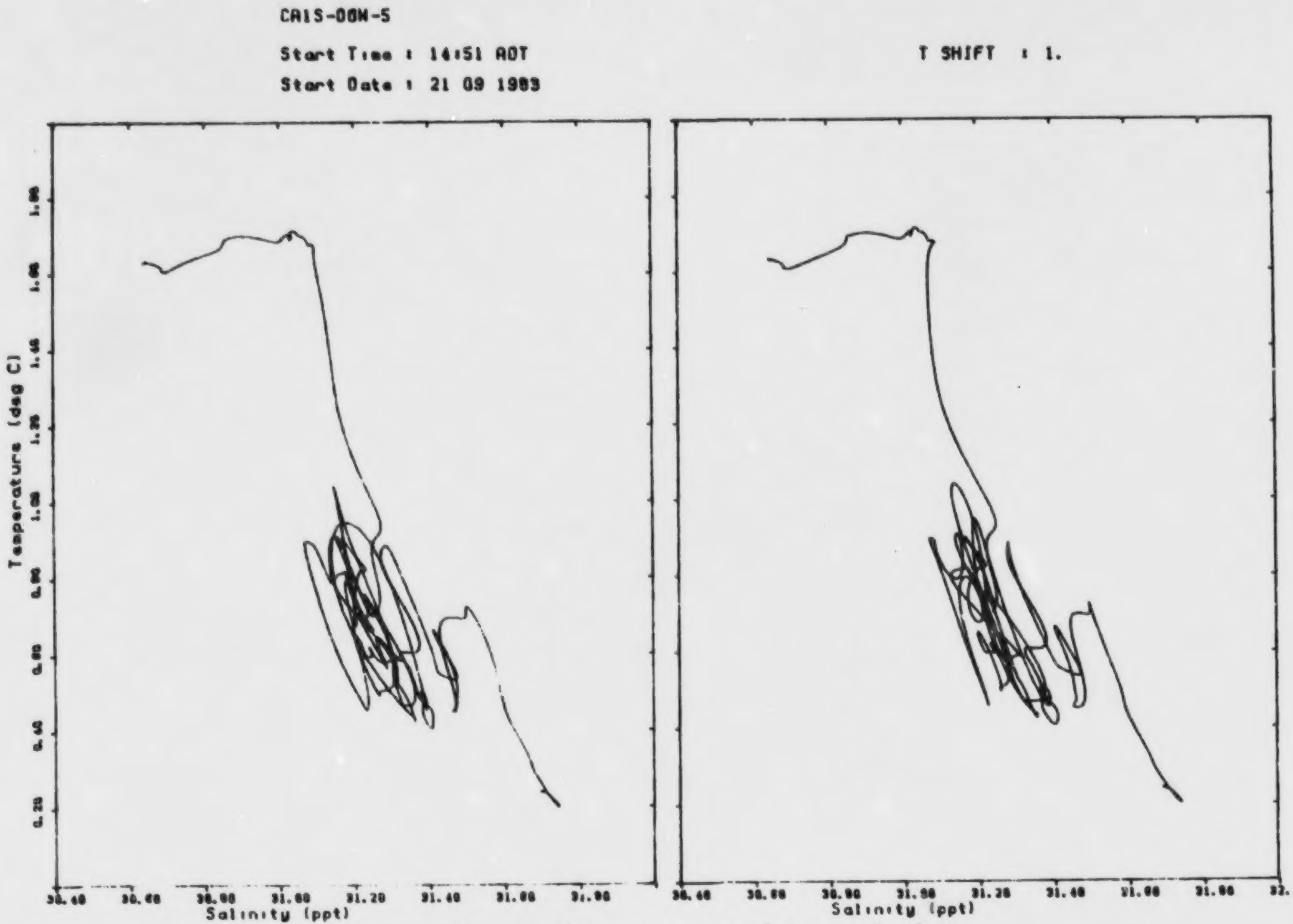


Figure 5-11. TS diagrams, sequential cast 5, down.

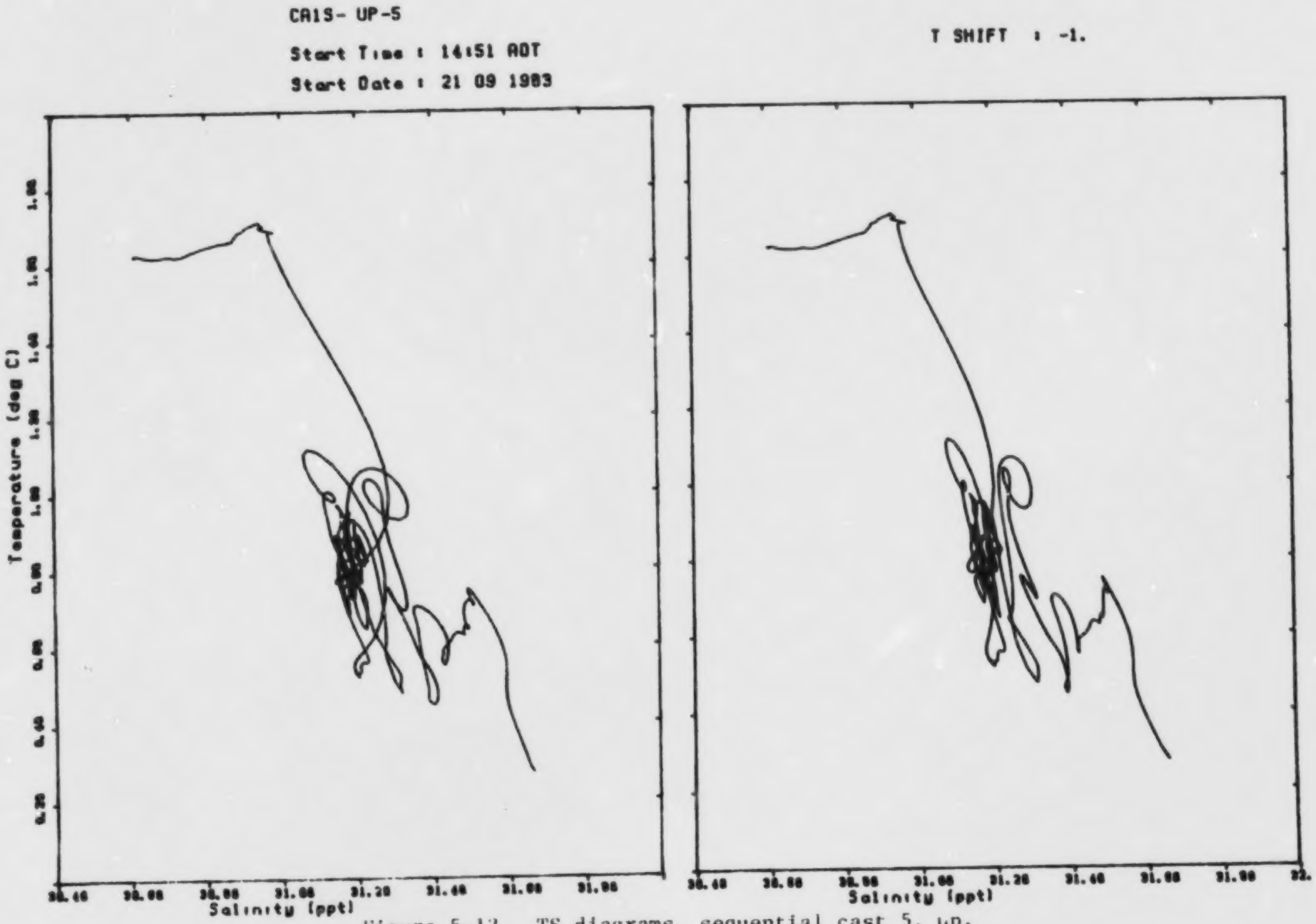


Figure 5-12. TS diagrams, sequential cast 5, up.

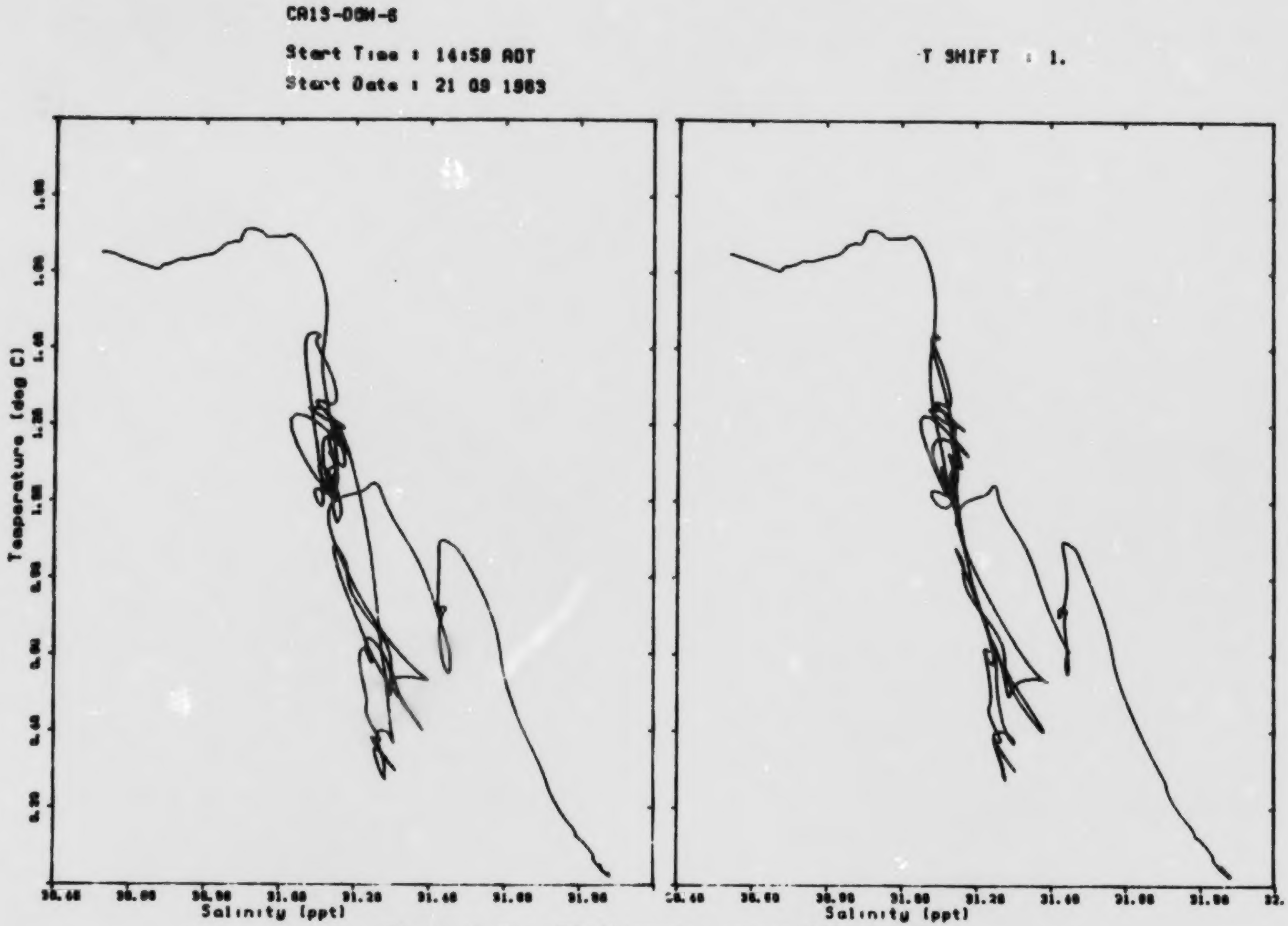


Figure 5-13. TS diagrams, sequential cast 6.

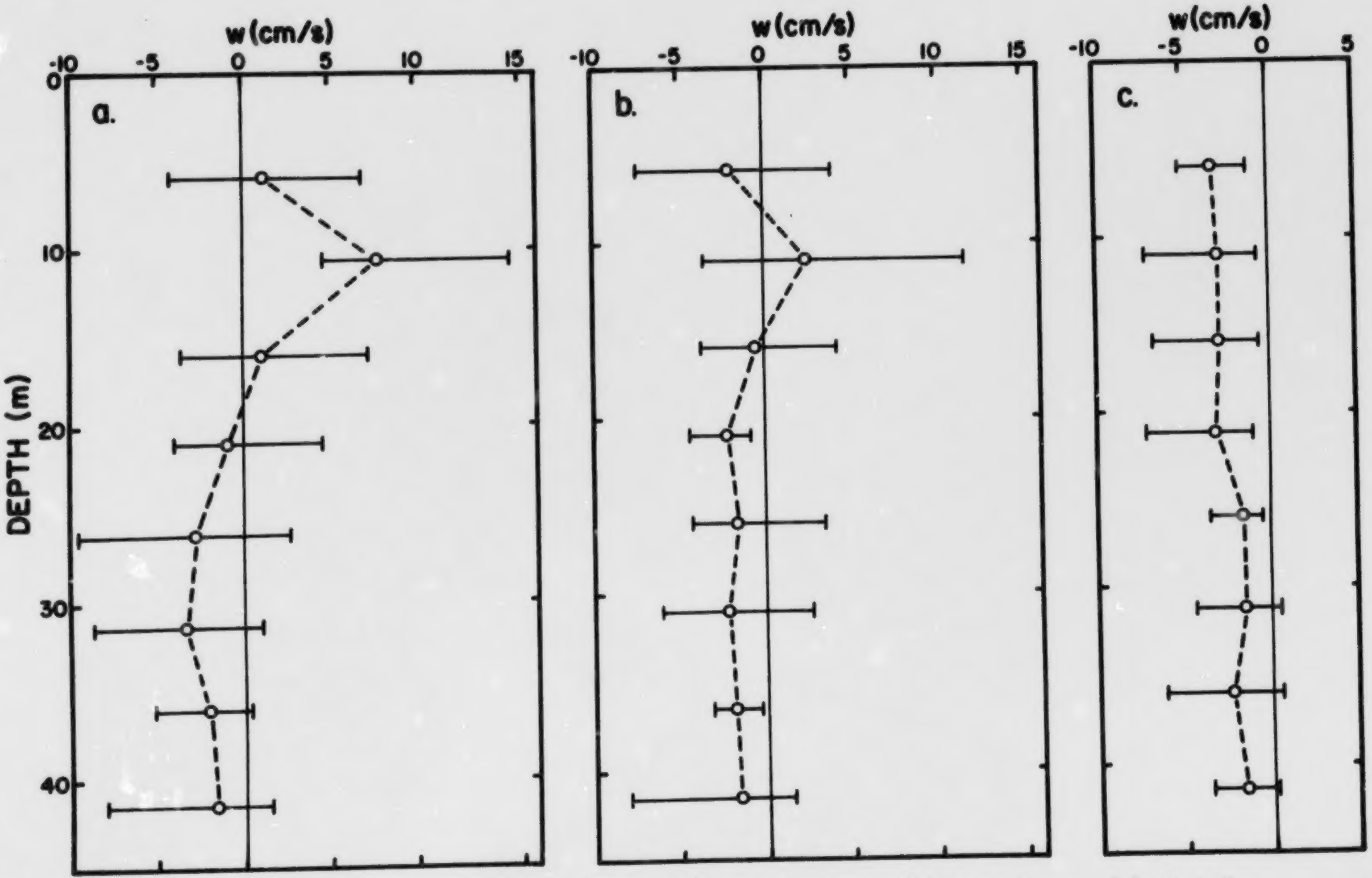


Figure 5-14. Vertical velocity profiles: (a) cast 1, down; (b) cast 1, up; (c) cast 2.

6.1

SEDIMENTOLOGY

of

ARCTIC FJORDS

EXPERIMENT

SAFE: 1983 MACROBENTHOS

and

BIOTURBATION

by

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OBJECTIVES

(a) To identify the dominant macrofauna.
(b) To compare grab and underwater photo results.
(c) To describe sedimentary structures from core radiographs in order to calibrate detailed seismic stratigraphy.

METHODS

Nine subsamples were taken from grabs before the remainder was sieved on a 2-mm screen and the macrofauna photographed. Animals were preserved in dilute buffered formalin and shipped to Scotland for identification. Although specific identifications were not possible in all instances a preliminary grouping of organisms/structures into 'natural units' was undertaken so that a cluster analysis could be performed on the data. Jaccard's and Czekanowski's coefficients were used (Boesch, 1977).

Negatives from the underwater camera were video recorded and a preliminary interpretation done onboard ship. The data were entered onto the 'Apple'. (This was unfortunate, for it transpired that resolution was far inferior to that of the subsequent black and white enlargements and colour slides, so that many errors and omissions were unwittingly committed).

Organism abundance was recalculated to individuals per m^2 for both grab and photographic data.

Natural size radiographs of cores were examined in both negative and positive modes and graphic logs produced.

RESULTS

This year we achieved a much better depth span but visited only three fjords. For this reason the bottom photographs do not show such a wide range of energy levels as in 1982 (cf. Farrow 1983), but this is more than compensated by the meaningful cluster analysis that was possible on the grab samples.

Results are summarized pictorially as follows:-

(A) Tables showing identification and abundance of organisms (i) seen on photographs (ii) sieved from grabs.

(B) Plates 1-4 showing macrobenthos sieved from grabs.

(C) Plates 5-9 are sea-bed photographs chosen to show dropstones and bioturbation structures : animals are numbered and identified in a key following the plate captions.

(D) Plate 10 shows details of radiographs from C04 piston core.

(E) Figures of sedimentary structures from piston cores (chiefly 1982 cruise).

(F) Dendrograms produced from (A).

Macrobenthos

The polychaete fauna contained few surprises compared with 1982 though we increased considerably the diversity of living bivalves because of our more thorough coverage of the shallower water. Thus mud-tubed maldanids and gravel-tubed onuphids were frequent and cluster into different associations (Figs.10,11). Cluster analysis of the photographs using Jaccard's coefficient gave meaningless results but Czekanowski's showed an onuphid association clearly linked to dropstone occurrence (Fig.9).

The mud- and mucus-walled long tubes often seen in bottom photographs (e.g. Plate 5b, no.32) were sampled in CA1 (82 04466) and are confirmed as sabellids. The coarse gravel tubes previously erroneously attributed to Pectinaria sp. by Farrow (1983, pp.9-8, 9-22) are now known to be onuphid polychaetes, cf, Hyalinoecia. The parchment-like tube worms referred to in the grab Table were all empty except for IN6 (82 04428) where a large example contained a phyllodocid polychaete. So far we have traced no reference to tube dwelling in these normally errant works, and with n=1 we are hesitant to project conclusions. We cannot yet say whether the occupant was also architect.

A variety of maldanid species seems to be present in the samples but these are taxonomically difficult and no identifications are yet available.

Other polychaetes include a scalibregmid from CA Si113 (18220) and possible nephtyds. There are also probable capitellids (other than maldanids) in several samples. Aphroditids also occur (e.g. CL1) : characteristically they lose their elytrae after transportation in formalin.

The most encouraging feature has been that subsequent scruting of the benthic samples has shown that the entities used in the cluster analysis are real, even if full identification remains to be determined for certain groups.

Cluster Analysis. Jaccard's coefficient is qualitative, dealing only with presence : absence. Czekanowski's is quantitative and can take advantage of the faunal counts. Too much reliance should not be placed on absolute values in the grab Table since nine subsamples had been removed before sieving for macrobenthos!

Despite reinterpretation of all 450 bottom photographs, cluster analysis yielded less meaningful results than for the grabs. Czekanowski reveals five clusters (Fig.9). 'Onuphid' sites contrast with 'ophiuroid/anemone' sites, though mean depths are not significantly different (154 cf. 159m). Dropstones are consistently associated with the former but not with the latter, suggesting a substrate influence. There is in addition, a geographical split, a feature noted recently by Thomson (1982) whose work suggested to him that "at depths of 25-250m, substrate does not appear to limit the distribution of most faunal assemblages" (p.70). It seems reasonable, however, to conclude that a direct correlation is indicated here, since if no gravel is available no tubes can be constructed! It is also significant that many of our stations are decidedly more proximal than Thomson's.

Both Jaccard's and Czekanowski's coefficient seem to have produced meaningful clusters of the grab data. Both produce a *Portlandia* association ($\bar{x}_j$=51m; $\bar{x}_c$=70m), a maldanid mud-tube association ($\bar{x}_j$=379;$\bar{x}_c$=333m), an onuphid gravel-tube association ($\bar{x}_j$=308m; $\bar{x}_c$=296m) and a "rag-bag" ($\bar{x}_j$=19-520m; $\bar{x}_c$=30-520m).

Possible correlations with sediment type, sedimentation rates and organic matter are awaited with interest. The *Portlandia* association might be expected to be associated with the faster rates but should also contain appreciable organic matter since these bivalves are deposit feeding protobranchs. The *Portlandia* community is widely recognised in the Arctic (Thorson, 1957) and Thomson (1982, fig.2) has clearly shown that bivalves dominate the biomass from 10-100m, though in his more open waters *Portlandia* itself was not recorded.

Analysis of the bottom photos has already indicated that the onuphids are associated with coarser ground (Fig.9) and it is likely that the maldanid mud tubes occur on soft mud bottoms and form a deposit-feeding system. The two elasipod stations clustered on the photo analysis turn up in this probably low-energy association (Fig.9).

The "rag bag" may possibly be linked by the occurrence of sediment mobility or stronger current activity, but whatever the explanation it must be as valid at 19m as at 520m. Ophiuroids seem to provide the faunal link.

Comparison of photo and grab clusters is disappointing in not showing a striking parallelism. An onuphid association was recognised by both but with a depth discrepancy probably to be explained by buried tubes not visible on the sediment surface : this would account for the larger number of stations where it was recognised by grab samples.

It is likely that epifaunal ophiuroids are under-represented in the grabs (included in the "rag bag") and the photo cluster is more meaningful. Furthermore there is no guarantee that the 'ophiuroids' in the pictures and grabs are necessarily all the same species.

SEDIMENTARY STRUCTURES IN CORES

MC1 : 329m (Figure 2)

recorded penetration = 11m
core length = 9.8m
shortening = 11%

Lithological breaks at 2.65m 3.25m 3.70m 6.10m.
several erosive based units* with reworked gastropods and lithic clasts, becoming more varved downwards : *could have been derived from slumped mass seen on seismic upslope. Varved unit persists beneath slump.

TI3A : 522m (Figure 3)

recorded penetration = 12.14m
core length = 6.84m
shortening = ???

Lithological breaks at 0.80m 4.75m 5.10m.
Burrowed to 3.75m, with nuculids; thin turbidites, then probable debris flow with slumping.

CO2 : 222m (Figure 4)

recorded penetration = 8.50m
core length = 8.50
shortening = zero

Lithological breaks at 3.90m 7.20m.
Very little burrowing, thin grainflow ? sands

CO4 : 356m (Figure 5)

recorded penetration = 10.63m
core length = 10.60m
shortening = zero

Lithological breaks at 2.75 - 3.40m (several erosion breaks) 5.00m.
Densely burrowed to 2.75m, then possible turbidite channel margin plus distal outer fan turbidites with occasional rippled units. Poorly reproduced seismic shows convergent reflectors in upper part of core

CA2 : 311m (Figure 6)

recorded penetration = 9.22m
core length = 9.22m
shortening = zero

Lithological breaks at 2.40m 3.80m 4.50m 4.85m 6.35m.
Sharp change in seismic character at c. 319m not apparent in core. Lowest part of core appears slumped whereas seismic is well bedded : suggests artifact in core.

CA6.0 : 665m (Figure 7)

recorded penetration = ?
core length = 8.80m
shortening = ?

Lithological breaks at 3.15m 3.95m.
Sandy section, occasionally conglomeratic : sequences of debris flows. Absence of burrowing.

MC7 : 497m (Figure 8)

recorded penetration = 11.21m
core length = 10.10m
shortening = 11%

Lithological breaks at 2.90m 3.35m 5.10m.
Seismic seems to indicate a lower slumped unit overlain by ponded, flat-bedded sediments, in turn overlain by recently slumped material. These divisions also appear in the core.

Interpretation

Further interpretation would be hazardous without consideration of two additional inputs. First, the regional location (position on long seismic lines, location of any side entries) : second, outcrop data from the geological record (will enable significant 'packages' of sediment to be identified).

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TABLE SHOWING THE NUMBER OF INDIVIDUALS PER SQUARE METRE OBSERVED ON BOTTOM PHOTOGRAPHS TAKEN IN SEPTEMBER-OCTOBER 1983 FROM THREE BAFFIN ISLAND FJORDS :-

CA = CAMBRIDGE MC = McBETH IT = ITIRBILUNG

STATION	Number of Frames	depth	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
A SU.1	51-73	102m		79	0.02	0.14	4.09	0.02				0.10			0.19		0.02		0.07	0.02	0.43
A 0.2	22-34	108m		109			5.00	0.04								1.00					
A 1.0	74-83	182m		163		0.55	0.30	0.10	0.05				0.05	0.10						0.05	0.05
A 1.1	109-128	183m		83	0.05	0.07										0.80	0.03				0.13
A 1.2	84-97	194m		131		0.12	0.38							0.08	1.54					0.12	
A 3.0	99-108	365m	0.80			0.25	8.45		0.05					0.05	3.00						
A SE3	149-64	225-397m		5		0.07	0.70	0.07		0.03		0.13	0.03	0.23	2.47		0.10				1.10
A 4.1	35-50	515m	0.10			0.19	0.66			0.03					0.06						
A 5.0	129-148	665m	0.60			0.10	0.20	0.17			2.27	0.05	0.03	0.08							
A 6.1	1-17	750m				0.07	0.29				1.39		0.25					0.04			
MC 65.5	447-482	168m				0.56	93.92	0.03	0.08			0.06		0.11		24.44					0.06
MC 0.1	367-387	150m			0.05	0.05	62.25		0.13						0.80	56.96		0.05			2.60
MC 2.1	347-366	380m	1.10			0.67	2.33	0.07					0.03	1.17		3.00					
MC 4.1	387-446	549m	1.05			0.25	1.05	0.03	0.05	0.03		0.05									
IT 0.1	218-236	72m					4.32	0.08													
IT 0.2	188-200	85m					0.80	0.14													
IT 0.4	200-221	140m	1.83			0.40	36.75	0.05				0.03	0.05								
IT 0.3	285-306	155m	1.03			0.50	55.80	0.15					0.05								
IT TR2	238-256	126m			3.39	0.12	43.38														
IT 1.1	165-182	266m																			
IT 1.2	271-284	283m	0.60	0.25		1.00	0.85	0.10	0.10				0.05	0.05	16.25	4.30					
IT 2.1	306-326	238m		0.75	0.10	0.10	3.85	0.07	0.15				0.07	0.43	1.90	7.23					
IT TR1	222-237	276m	0.78	0.47	0.13	0.64	13.50	0.06	0.08				0.08	0.85		72.37					
IT 2.3	327-346	424m	0.37			0.83	8.13	0.13	0.17		0.03	0.03	0.07		0.75						

EPIFAUNA (soft substratum)

sessile

a. sabellid tubes

b. onuphid tubes

c. sea pens

d. anemones

mobile

e. ophiuroids (+ Astarnaites)

f. buccinid gastropods (+ trails)

g. pycnogonids

h. caridean shrimp

i. elasipod holothurians

j. fish

INFAUNA

k. irregular echinoid furrows

l. ?callianassid burrows and volcanoes

m bivalve siphon openings

n. burrow pits

EPIFAUNA (rock)

sessile

o. sponges

p ascideans

q. alcyonaceans

r. bryozoans

mobile

s. "bristly" ophiuroids

t DROPSTONES

(% of frames)

TABLE SHOWING THE NUMBER OF INDIVIDUALS PER SQUARE METRE RECOVERED FROM GRAB SAMPLES TAKEN IN SEPTEMBER-OCTOBER 1983 FROM THREE BAFFIN ISLAND FJORDS:-

CA = CAMBRIDGE MC = McBETH IT = ITIRBILUNG

STATION	DEPTH	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
A P.E	19m					104	17														
A BAY	15m																				
A 0·2	125m		73		15				7							200					
A 1·0	181m	7			15			22		15			7								
A 1·2	190m		110					7			22										
A 0·3	200m		88		22					22	15										
A 1·4	218m	292	44		15					7	7										
A 8·5	225m			44			7	44							1000						
A 1·3	240m	73	73																		
A 1·5	262m	219	37					139													
A 8·4	292m					7						22									22
A 1·7	310m	58	44	7				15				7									
A 8·3	322m	29		15		7		7				22									
A 8·2	327m	29		·			7					7			7						
A 8·1	397m	15		29				15				15	15		73	15					(1)
A 4·2	518m		50	60									44								
A 4·1	520m																				7
A 4·3	560m	7	15																		
A 7·1	640m	37										7		15						7	
A 6·1	760m	100											7	7							
MC 85	5m	36			470				174								52				
MC 16	10m	870							444								104				
MC 35	20m	70							109									55			
MC 175	20m	887							17	17	70		139						35		
MC 236	30m								17												
MC 185	32m	348							(17)		(17)		52					244			
MC 186	40m								452				(17)				(40)	182			17
MC 195	42m																				
MC 0·1	182m																				
MC 2.0	320m	95						15					73								
MC 2.1	380m	44						15									(1)			7	7
MC 3·6	439m	183											15								
MC 4·1	549m		7					51		29			219			17					
IT 0.1	55m								197												
IT 0.2	65m								7												7
IT 0.4	148m	15							554												
IT 0.3	155m	15							956												
IT 3.0	175m		73		7	7*					(1)		(1)			73				7	60
IT 1.1	256m	44		7											7	15					
IT 1.2	298m	44		7																	
IT 2.1	310m	58			7			(7)			29		29			73					
IT 3.1	386m	117	117	22							15										
IT 2.2	402m	44		73																	
IT 2.3	424m	117																			
IT 6.0	502m	37		132				(7)			(7)		15		44						

POLYCHAETES

- A. maldanid : mud tube
- B. onuphid : gravel tube
- C. parchment-tube worms
- D. maldanid : coiled sand tube

BIVALVES

- E. *Astarte montagui* (**A. striata*)
- F. *Astarte borealis*
- G. *Yoldiella* sp.
- H. *Portlandia arctica*
- I. *Nucula ?bellotti*
- J. *Macoma calcarea*
- K. *Bathyarca glacialis*
- L. *Axinopsida orbiculata*

- M. INFAUNAL HOLOTHURIANS
- N. BRANCHED AGGLUTINATED FORAMINIFERA
- O. BEADED AGGLUTINATED FORAMINIFERA

- P. ? *Modiolaria* sp.
- Q. *Hiatella arctica*
- R. *Mya truncata*
- S. *Cuspidaria glacialis*

- T. OPHIUROIDS

Plate Captions

Plate 1. Benthos sieved from grab samples taken in Cambridge Fjord: photographed on board ship. Note that 9 subsamples had been taken before sieving each sample! Area of grabs 37 x 37 cm (small Van Veen) or 24 x 24 cm (Ekman, inshore): square tags are 12 mm wide. Note the dominance of bivalves and polychaetes: identifications on Table 1.

Plate 2. Benthos from Itirbilung Fjord. Note the abundant *Portlandia* (bivalves) at 155 m.

Plate 3. Shallow-water benthos from McBeth Fjord. Note the abundant *Hiatella* (bivalves) at 32 m.

Plate 4. Shallow-deep water benthos from McBeth Fjord. Note the sabellid tubes from 439 m and the diverse bivalves from 549 m.

Plate 5. a) CS 64 : stony, shelly sediment on sill
b) CS 394 : mottled level bottom with leech (3), ophiuroids (18) and sabellid (32)

(width of view in all bottom photographs is 1.67 m)

Plate 6. a) CS 67 : poorly sorted angular and rounded dropstones
b) CS 320 : isolated dropstone with crinoid (26)

Plate 7. a) CS 377 : ascideans on dropstone (15)
b) CS 155 : sponges on dropstone (24)

Plate 8. a) CS 331 : neogastropod trails (22)
b) CS 278 : burrow pits (of small infaunal bivalves)

Plate 9. a) CS 325 : larger bivalve siphon openings (right)
b) CS 153 : crustacean burrows with secondary shrimp inhabitants (20, 21)

Plate 10. Radiographs of core C04:- a) graded turbidite sand above floating rounded sandstone clast: b) ?turbidity current channel margin or slumped mass: c) basal upward coarsening unit; d, e) distal turbidites thinning downwards to varve-like units; f) epizoan trace above centre with bright ?heavy mineral influxes below, one with ripple lamination: g) small-scale, silty, graded units: h) rippled sand incursions (note bipolar directions at top of thickest unit).

A log of this core is shown as Fig. 5.

Identification of organisms on bottom photographs (Plates 5-9)

1. Polynoid scaleworm
2. Pycnogonid no. 1
3. Leech
4. Alcyonacean no. 1
5. Fish (rat tail?)
6. Retracted coelenterate
7. Bryozoan
8. ?*Bugula* or ?*Cellaria* type bryozoan
9. ?Bryozoan
10. Articulate brachiopod, e.g. *Laqueus*
11. ?Sponge or tunicate
12. ?Stranded ctenophore
13. Ophiuroid (swollen gonads) no. 1
14. Fish (gadoid?)
15. Ascideans
16. Irregular echinoid
17. Hard ground ophiuroid
18. ?Sea pen
19. Agglutinated worm tube (onuphid)
20. Shrimp (secondary resident)
21. Shrimp (processid)
22. Buccinid gastropod
23. Actinian
24. Sponge
25. *Gorgonocephalus*
26. Crinoid (?*Heliometra*)
27. Pycnogonid no. 2
28. Caridean, mysid or euphausiid
29. *Crossaster*
30. Ophiuroid no. 2
31. Elasipod holothurian
32. Sabellid
33. Alcyonacean no. 2
34. Bryozoan cf. *Cellaria*
35. Regular echinoid
36. Bivalve e.g. *Astarte*
37. Sponge, cf. *Polymastia*

PLATE 1

CAMBRIDGE FJORD

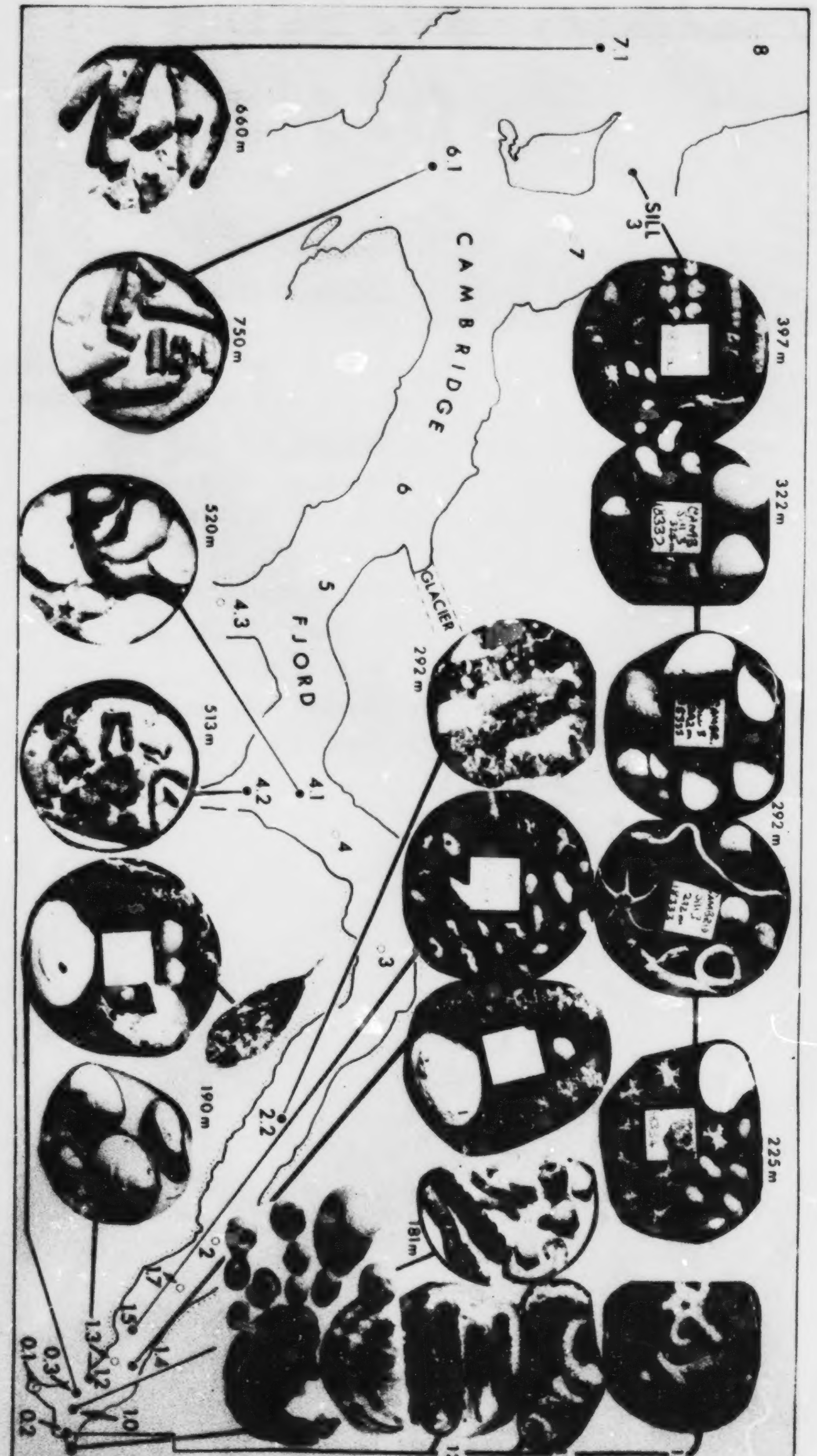
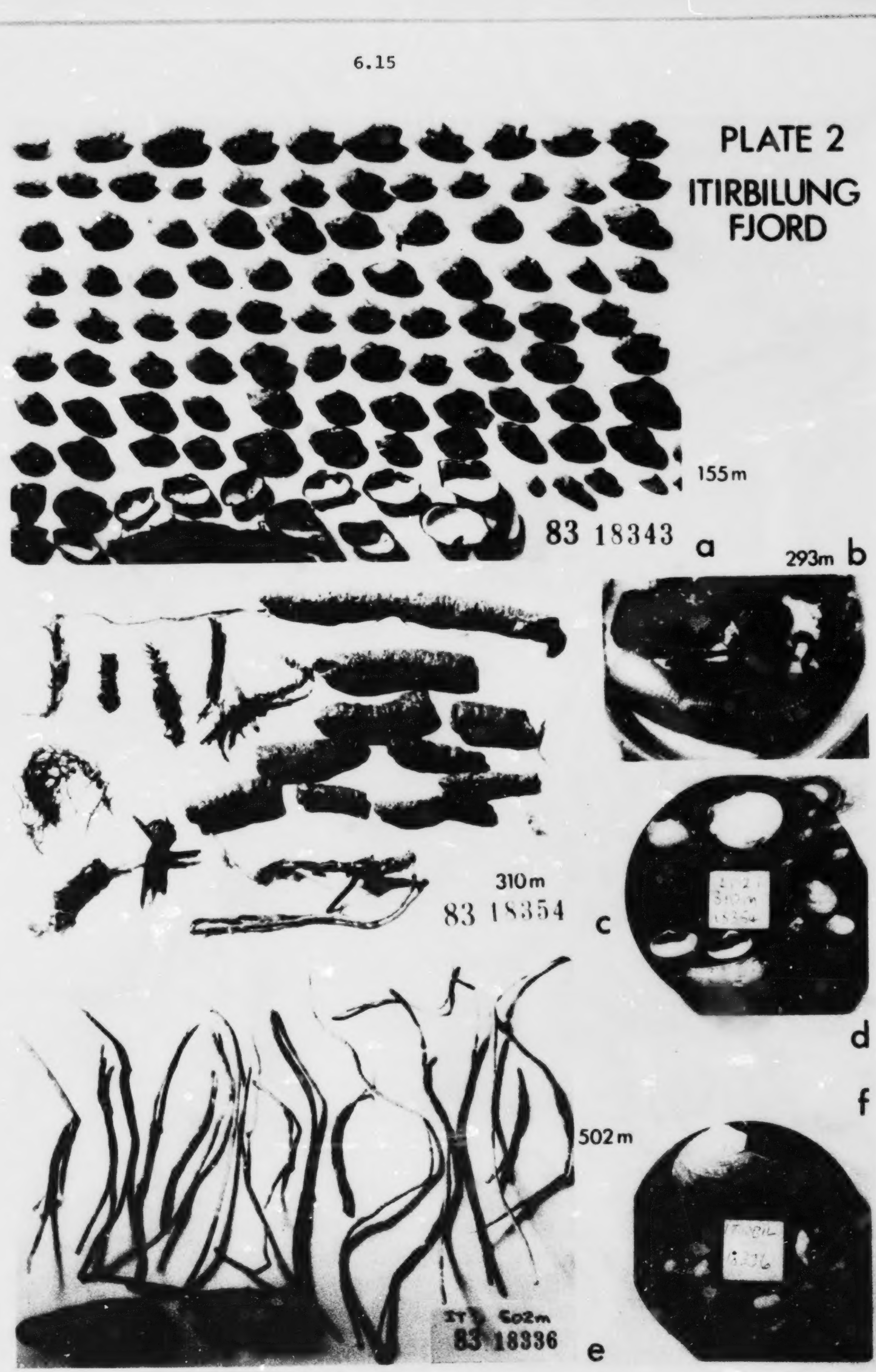


PLATE 2

ITIRBILUNG FJORD



McBETH FJORD shallow

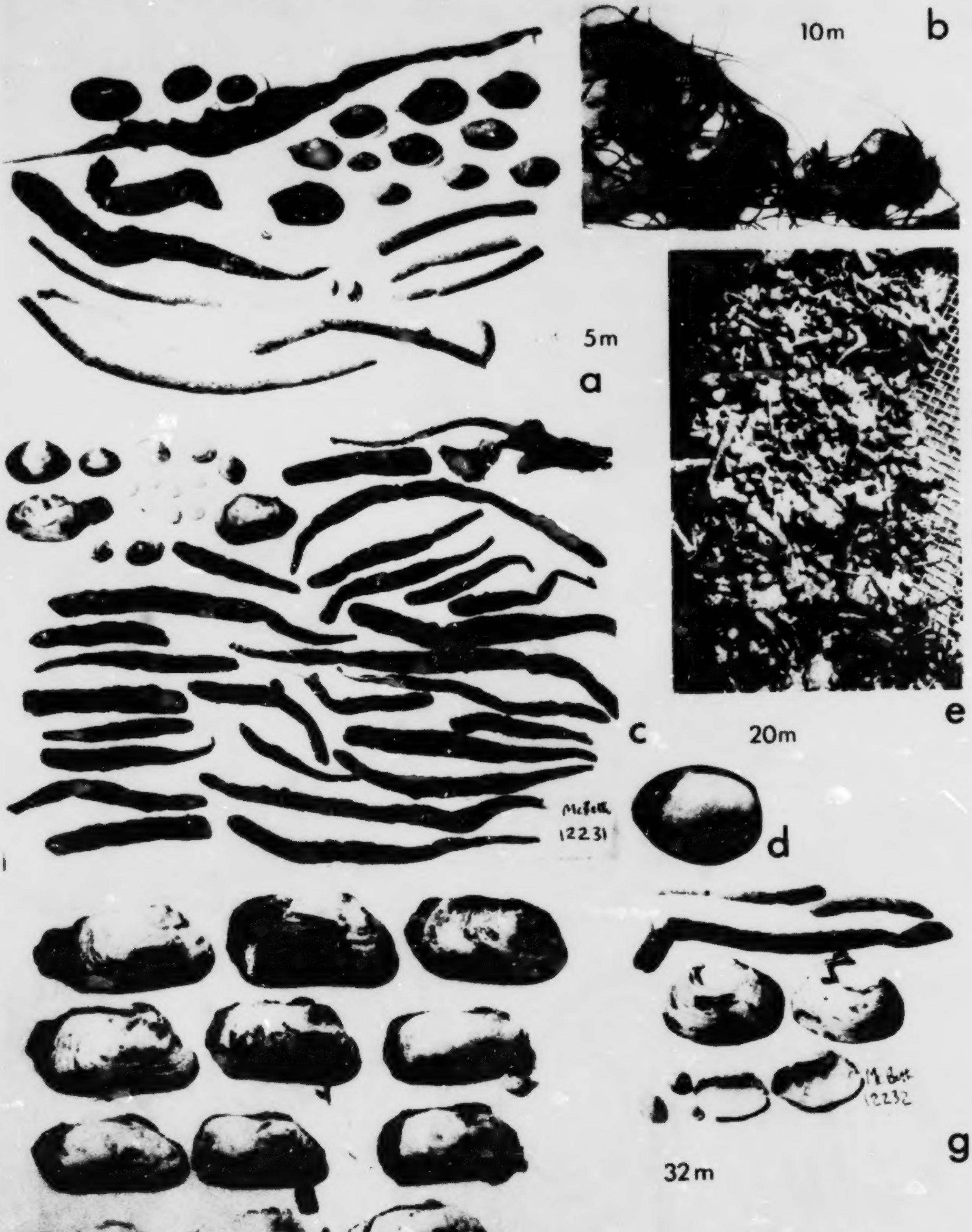


PLATE 3

McBETH FJORD shallow-deep

PLATE 4

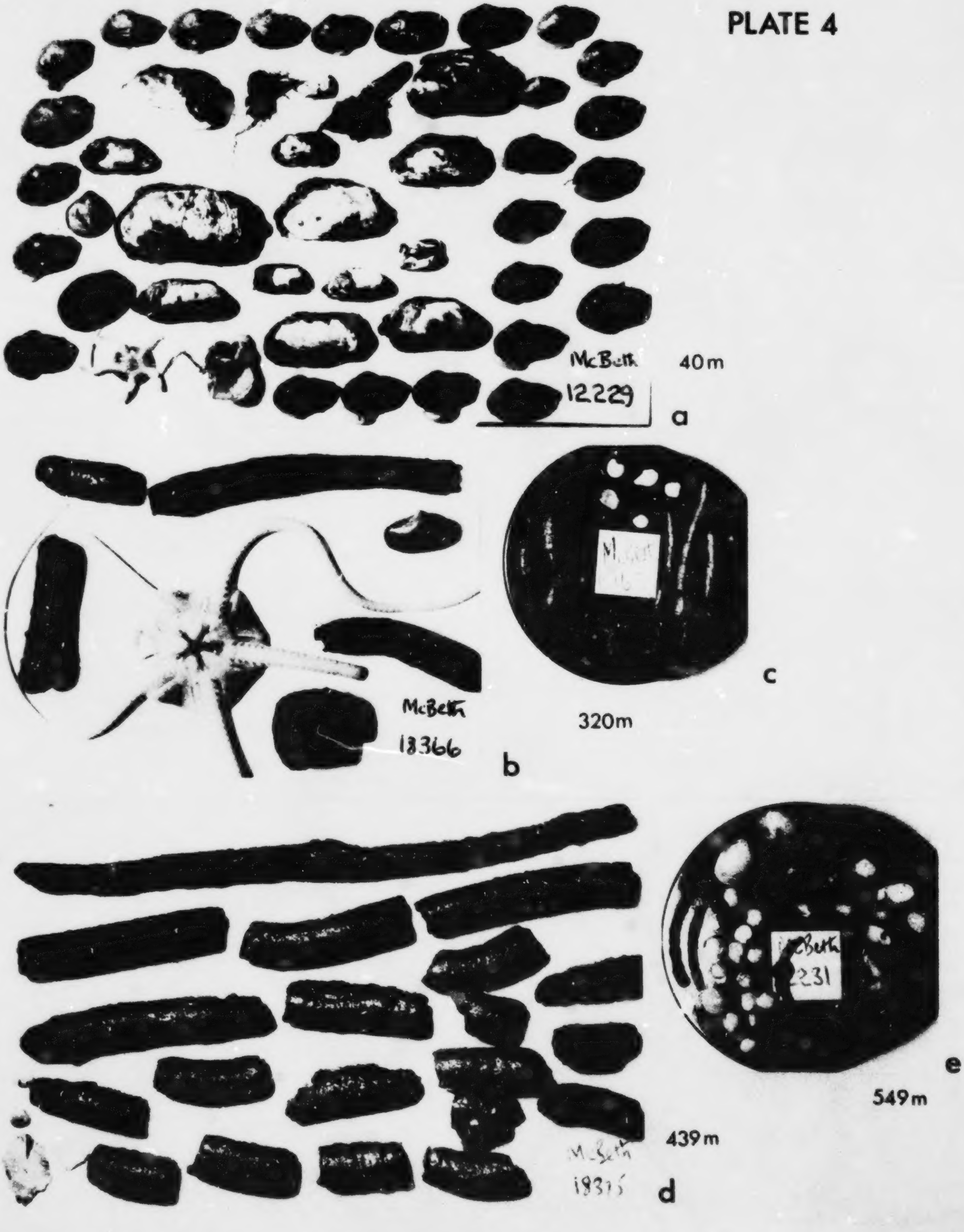


PLATE 6 a: CA Sill 1 b: IT 2.1 288m

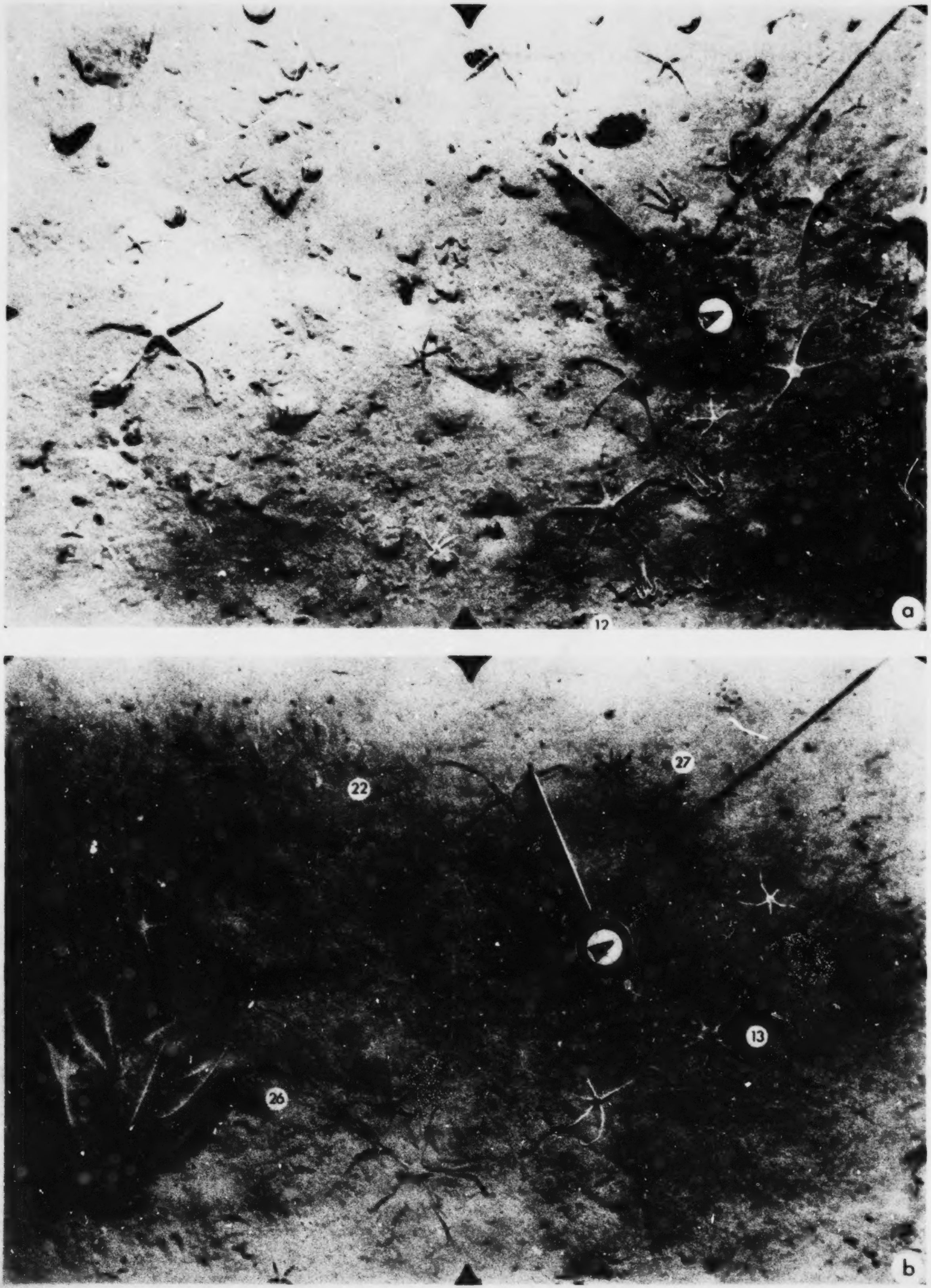


PLATE 5 a: Cambridge Sill 1 b: McBeth 549 m

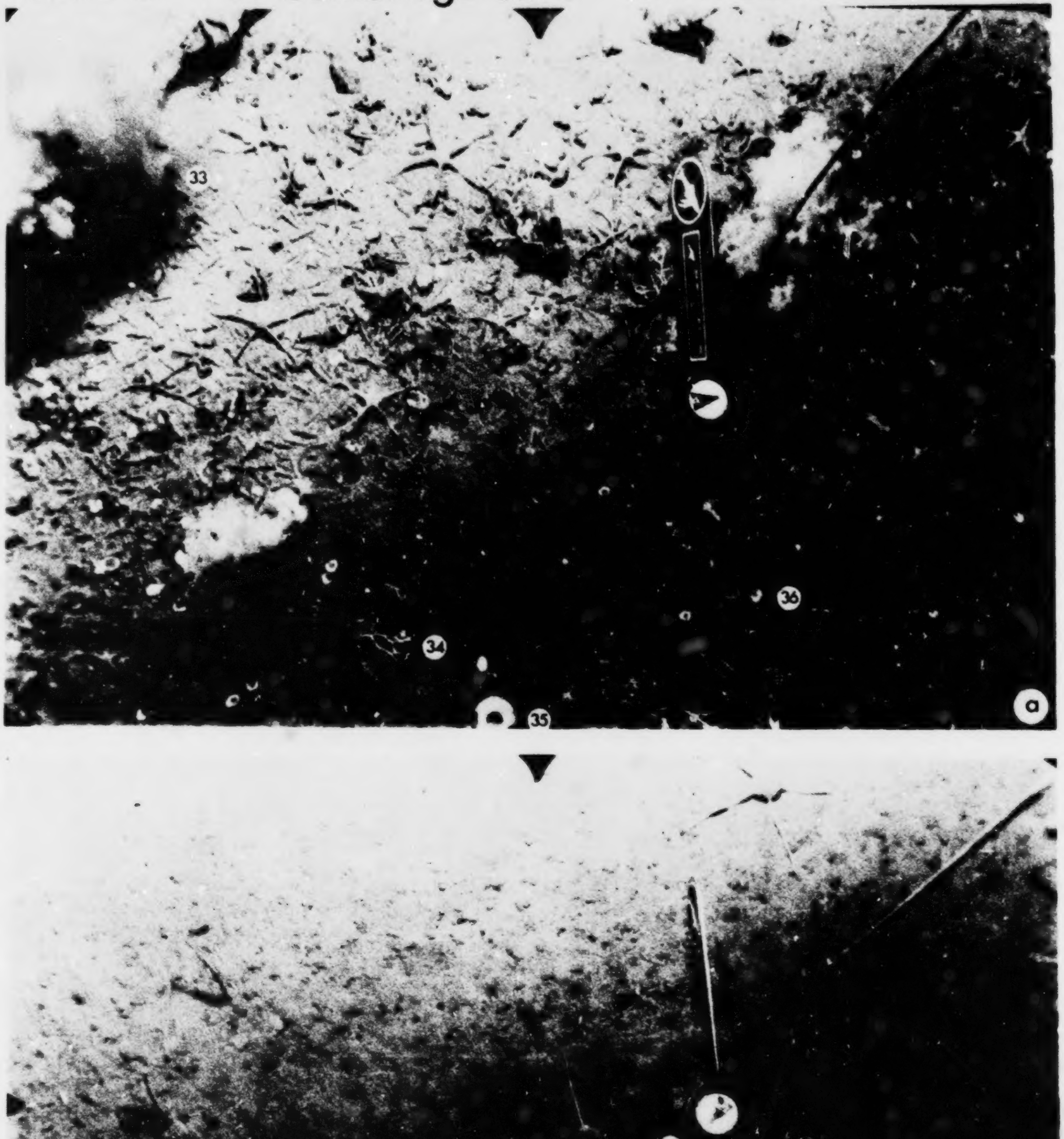


PLATE 8 a: IT2.3 424m b: IT1.2 283m

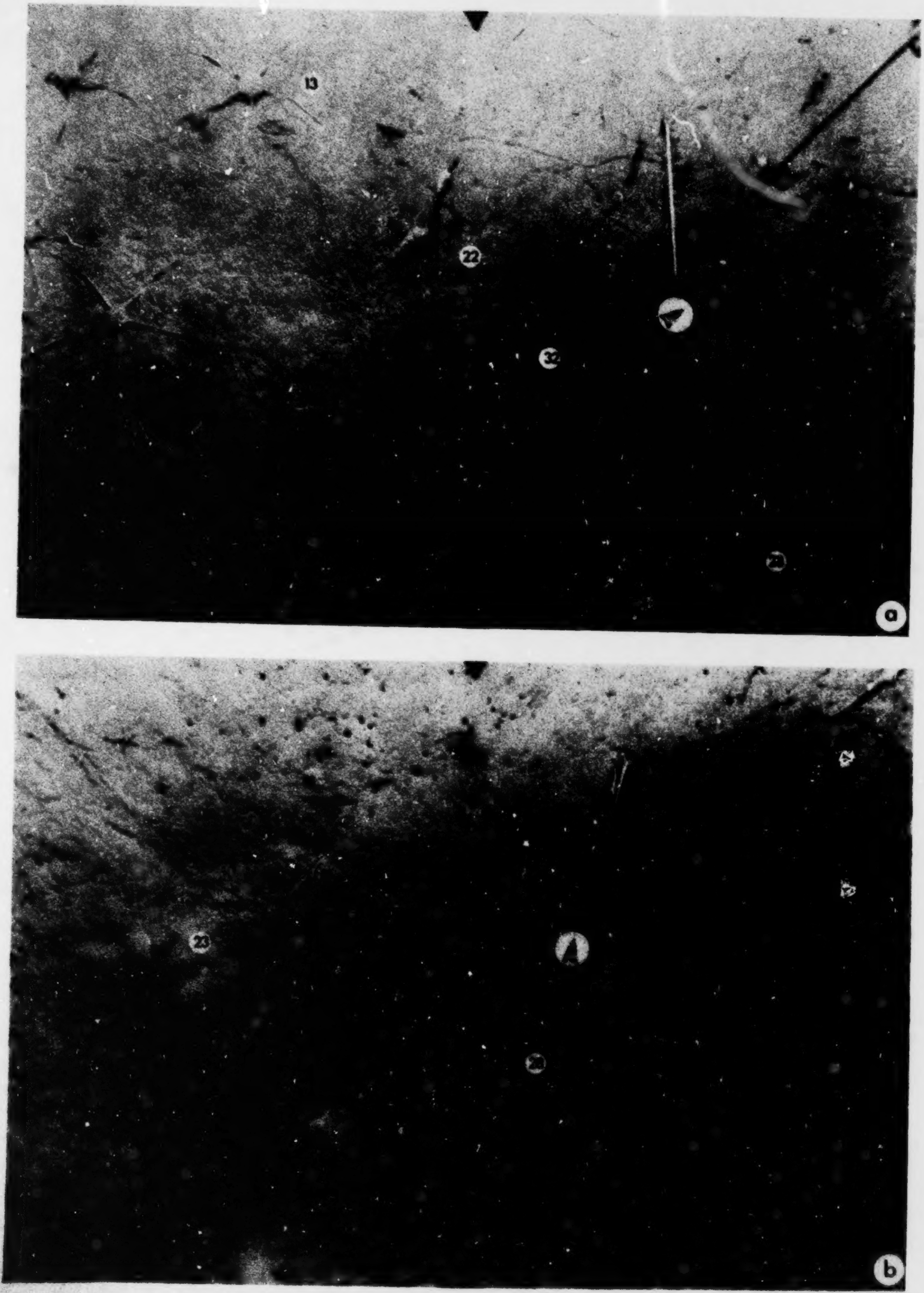


PLATE 7 a: MC O.1 150m b: CA Sill 3

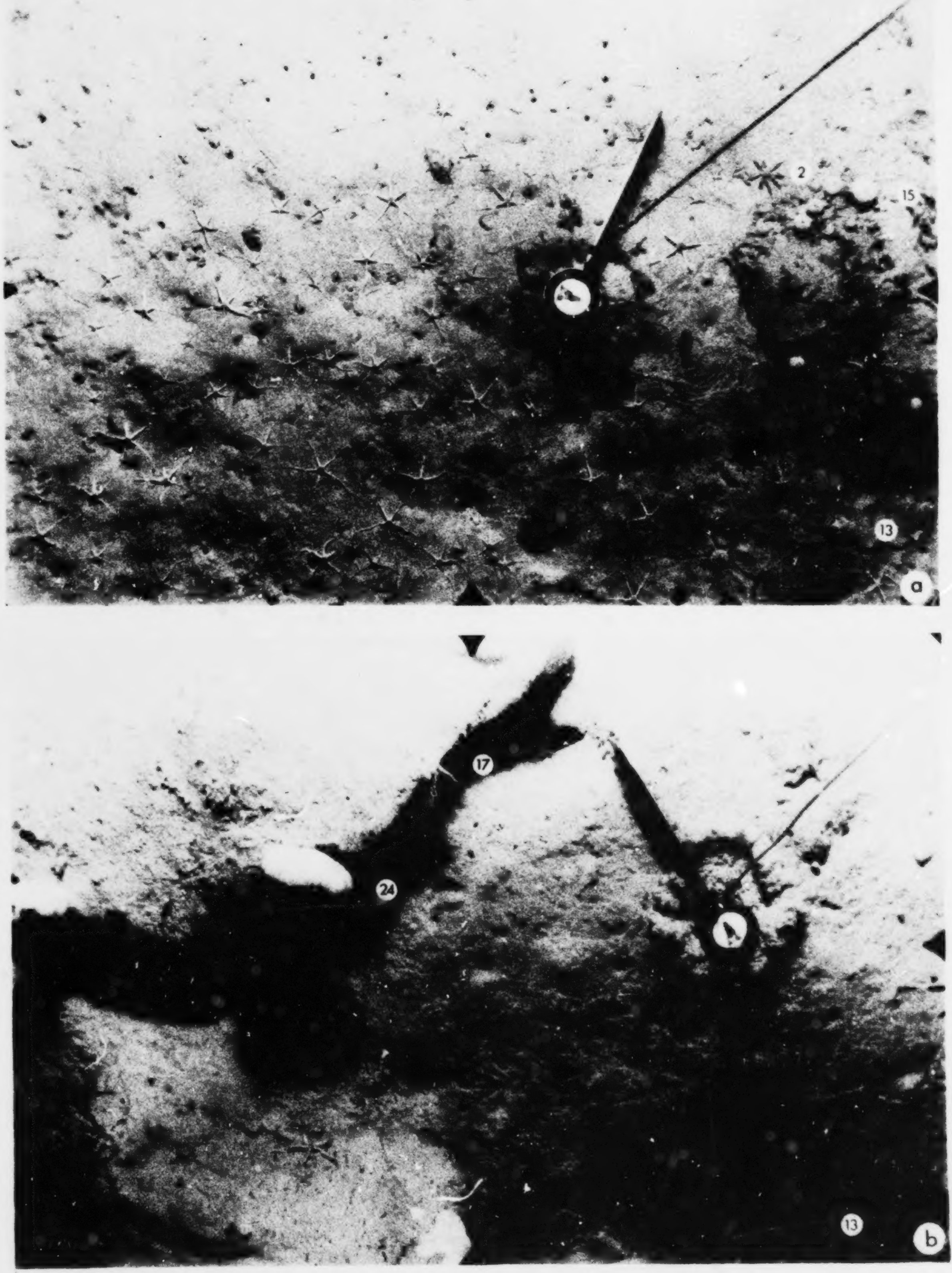
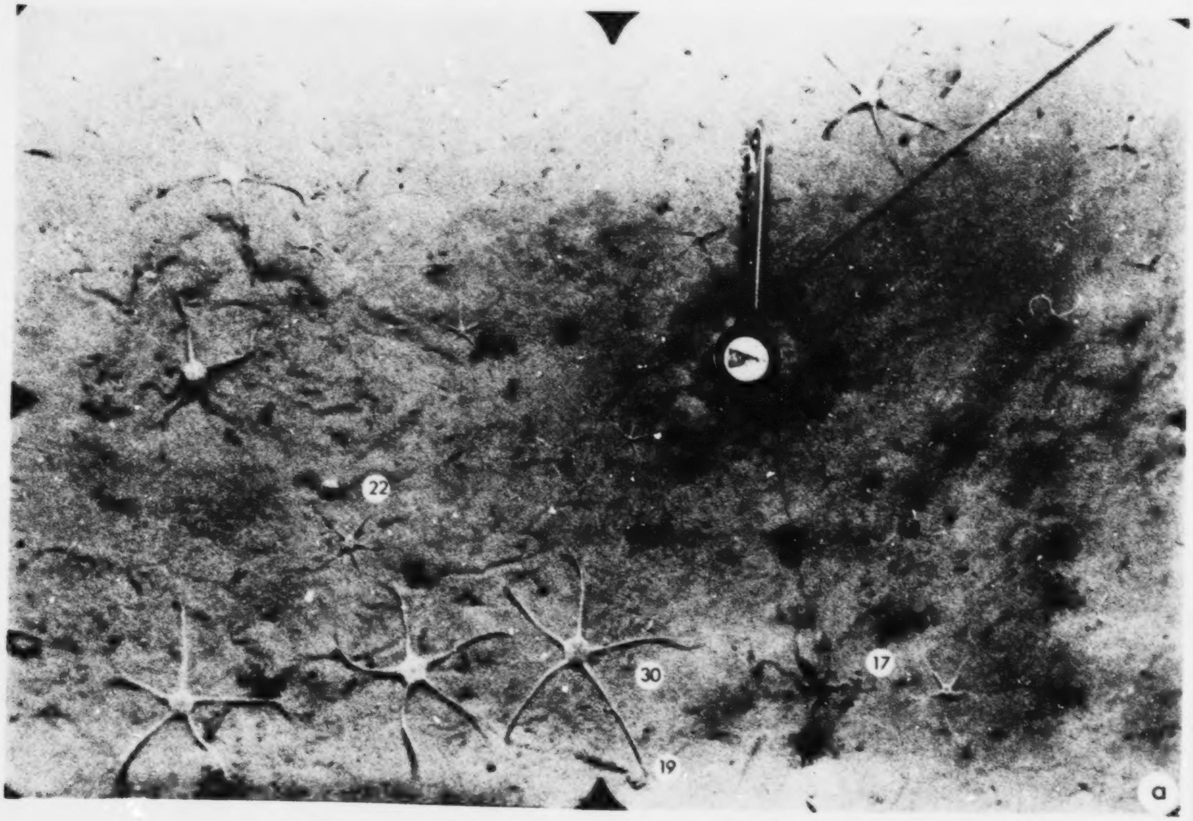


PLATE 9

a: IT 2.1 288m b: CA Sill 3 225m



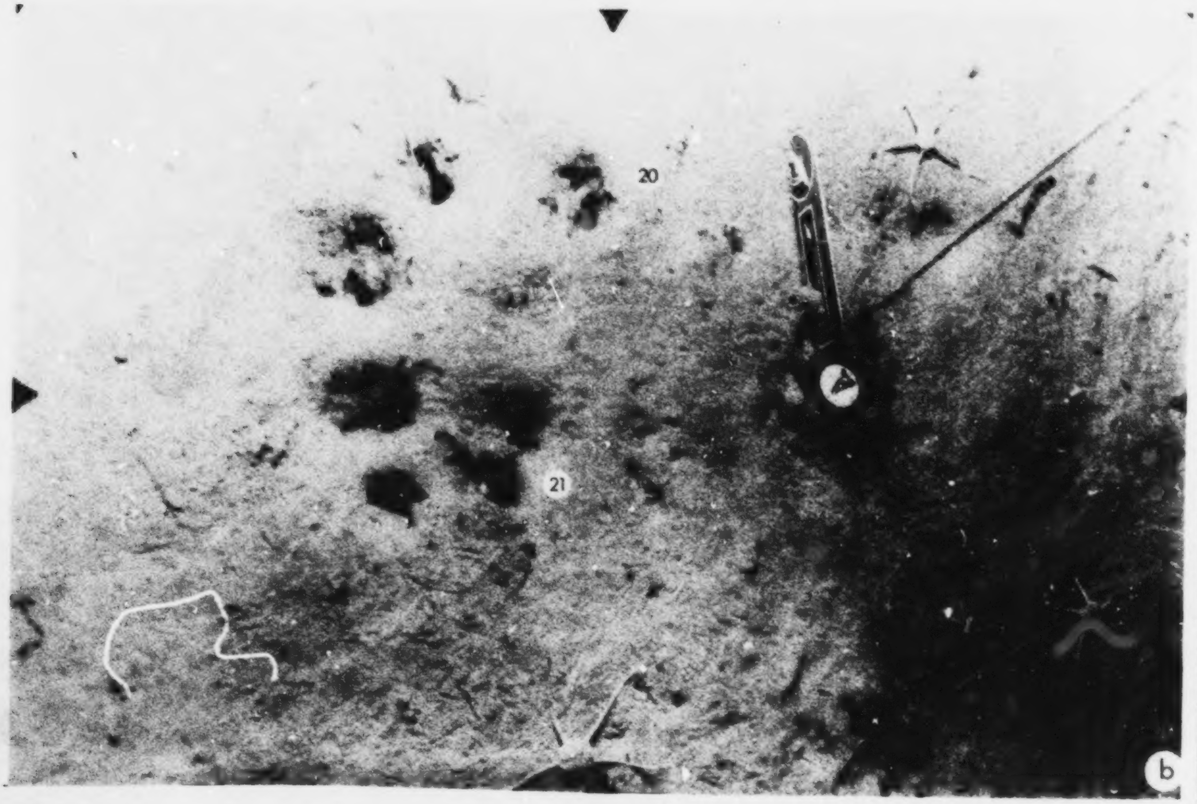
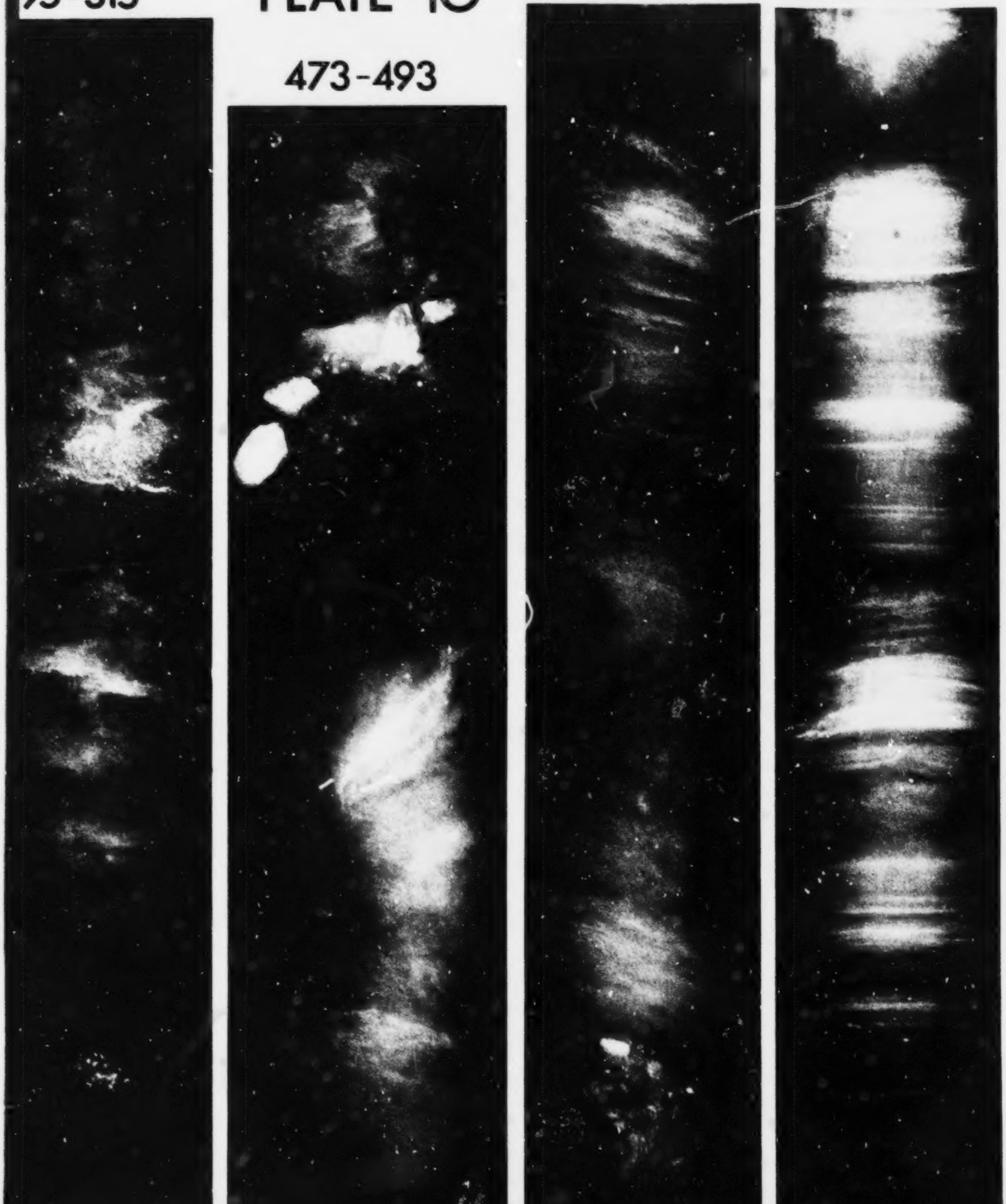


PLATE 10



95-315

473-493

493-513

573-593

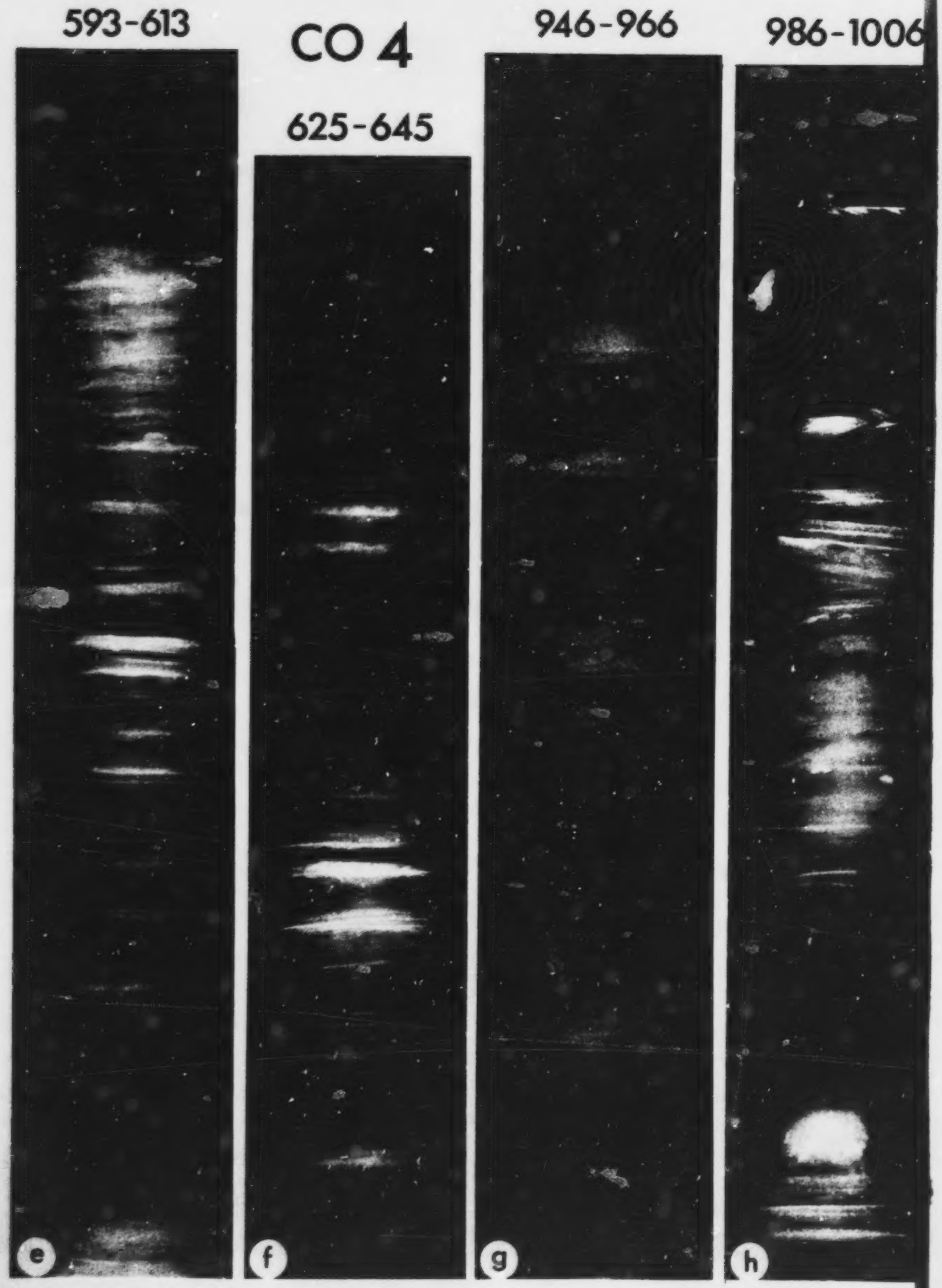

593-613
CO 4
625-645
946-966
986-1006
e
f
g
h

FIGURE 1 SEDIMENTARY STRUCTURES IN LE-HEIGH CORES AS REVEALED BY X-RADIOGRAPHS

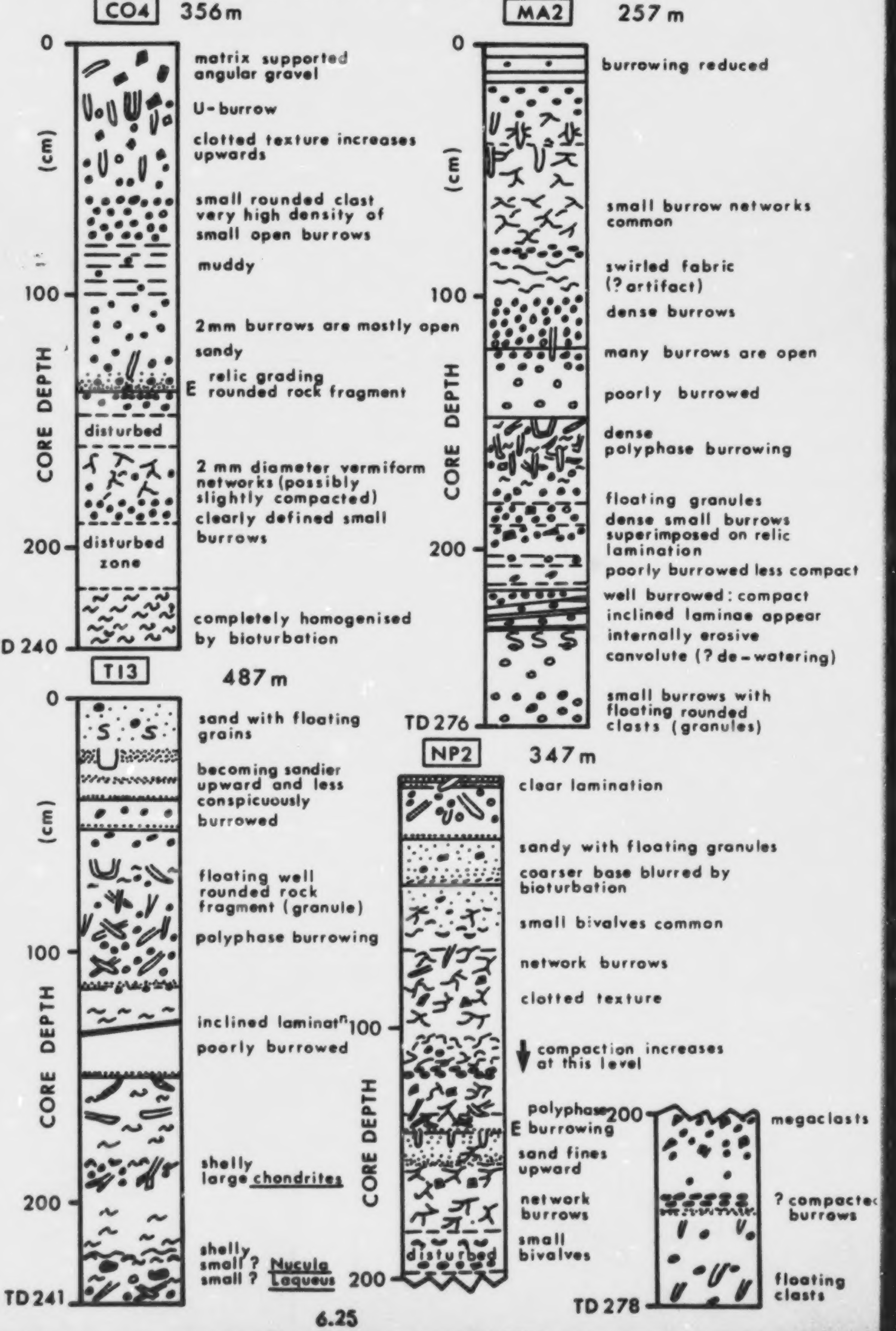

CO4
356m
0
100
200
TD 240
CORE DEPTH (cm)
matrix supported angular gravel
U-burrow
clotted texture increases upwards
small rounded clast very high density of small open burrows
muddy
2mm burrows are mostly open
sandy
relic grading
E
rounded rock fragment
disturbed
2 mm diameter vermiform networks (possibly slightly compacted)
clearly defined small burrows
disturbed zone
completely homogenised by bioturbation
MA2
257 m
0
100
200
TD 276
CORE DEPTH (cm)
burrowing reduced
small burrow networks common
swirled fabric (? artifact)
dense burrows
many burrows are open
poorly burrowed
dense polyphase burrowing
floating granules
dense small burrows superimposed on relic lamination
poorly burrowed less compact
well burrowed: compact
inclined laminae appear
internally erosive
convolute (? de-watering)
small burrows with floating rounded clasts (granules)
T13
487 m
0
100
200
TD 241
CORE DEPTH (cm)
sand with floating grains
becoming sandier upward and less conspicuously burrowed
floating well rounded rock fragment (granule)
polyphase burrowing
inclined laminatn
poorly burrowed
shelly large chondrites
shelly small ? Nucula small ? Laqueus
NP2
347 m
100
200
200
TD 278
CORE DEPTH
clear lamination
sandy with floating granules
coarser base blurred by bioturbation
small bivalves common
network burrows
clotted texture
compaction increases at this level
polyphase burrowing
E
sand fines upward
network burrows
small bivalves
disturbed
megaclasts
? compacted burrows
floating clasts

FIGURE 2 SEDIMENTARY STRUCTURES REAVEALED BY X-RADIOGRAPHS OF McBETH FJORD CORE MC1

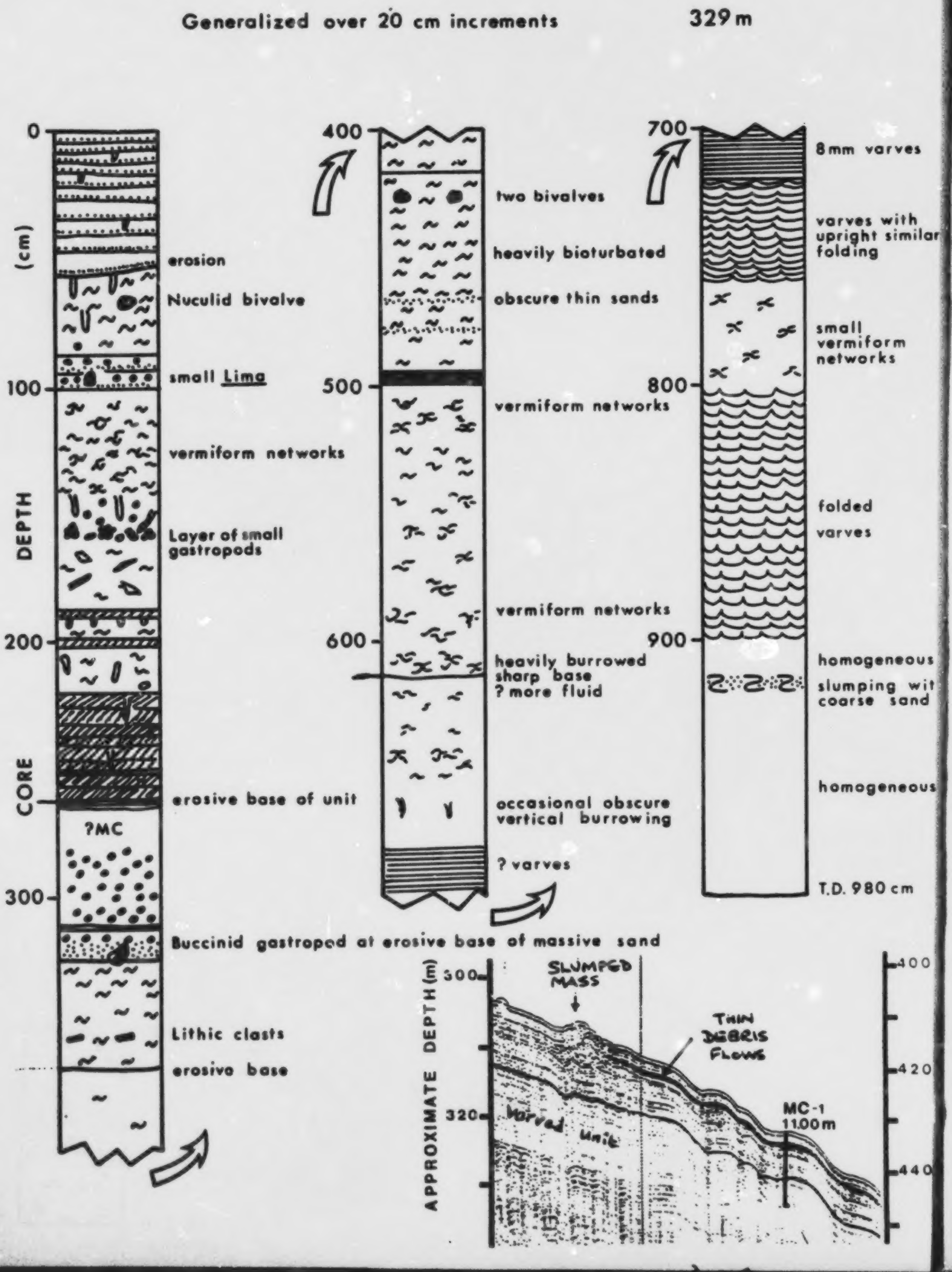
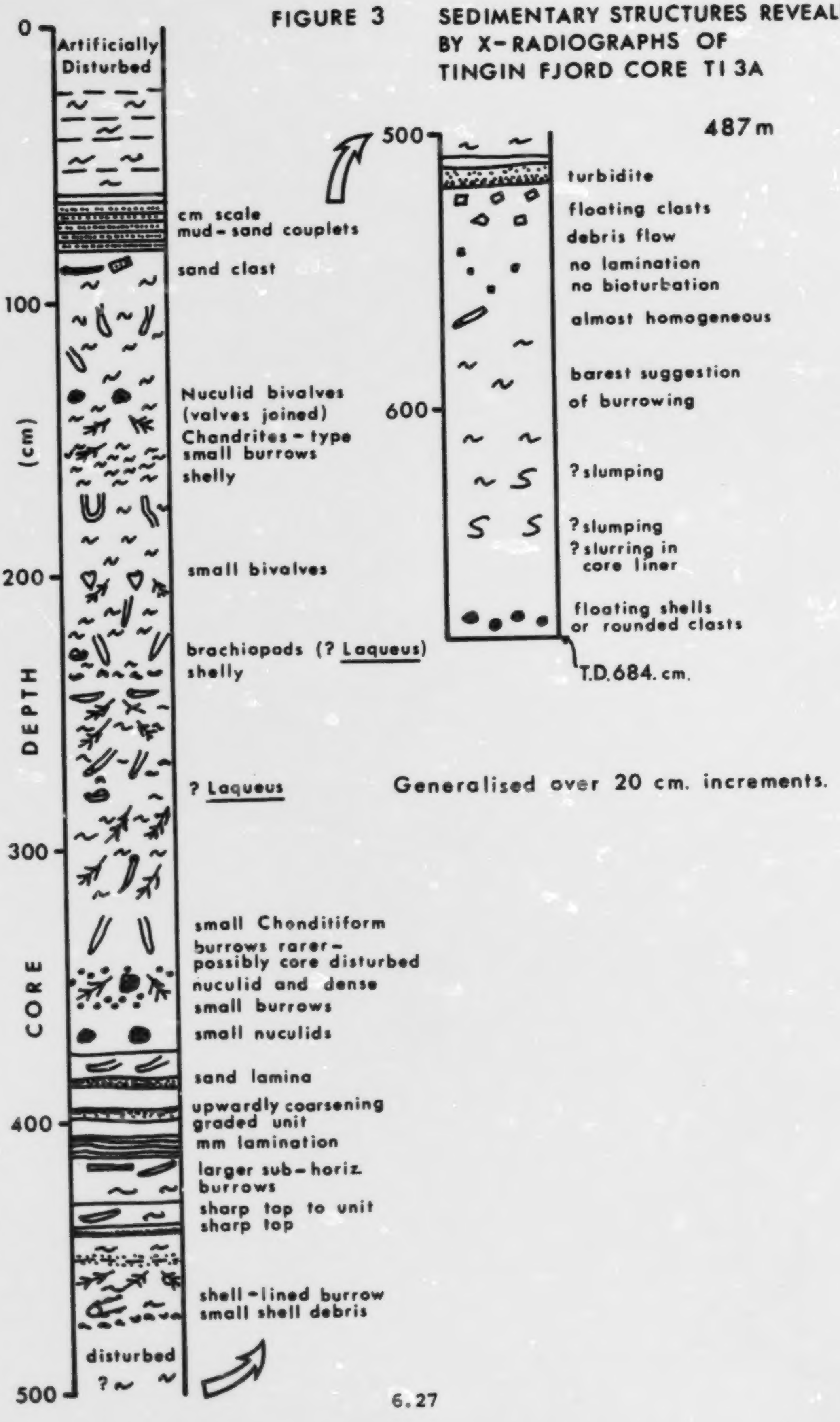


FIGURE 3 SEDIMENTARY STRUCTURES REVEALED BY X-RADIOGRAPHS OF TINGIN FJORD CORE TI 3A



Generalised over 20 cm. increments.

FIGURE 4 SEDIMENTARY STRUCTURES REVEALED BY X-RADIOGRAPHS OF CORONATION FJORD CORE CO2

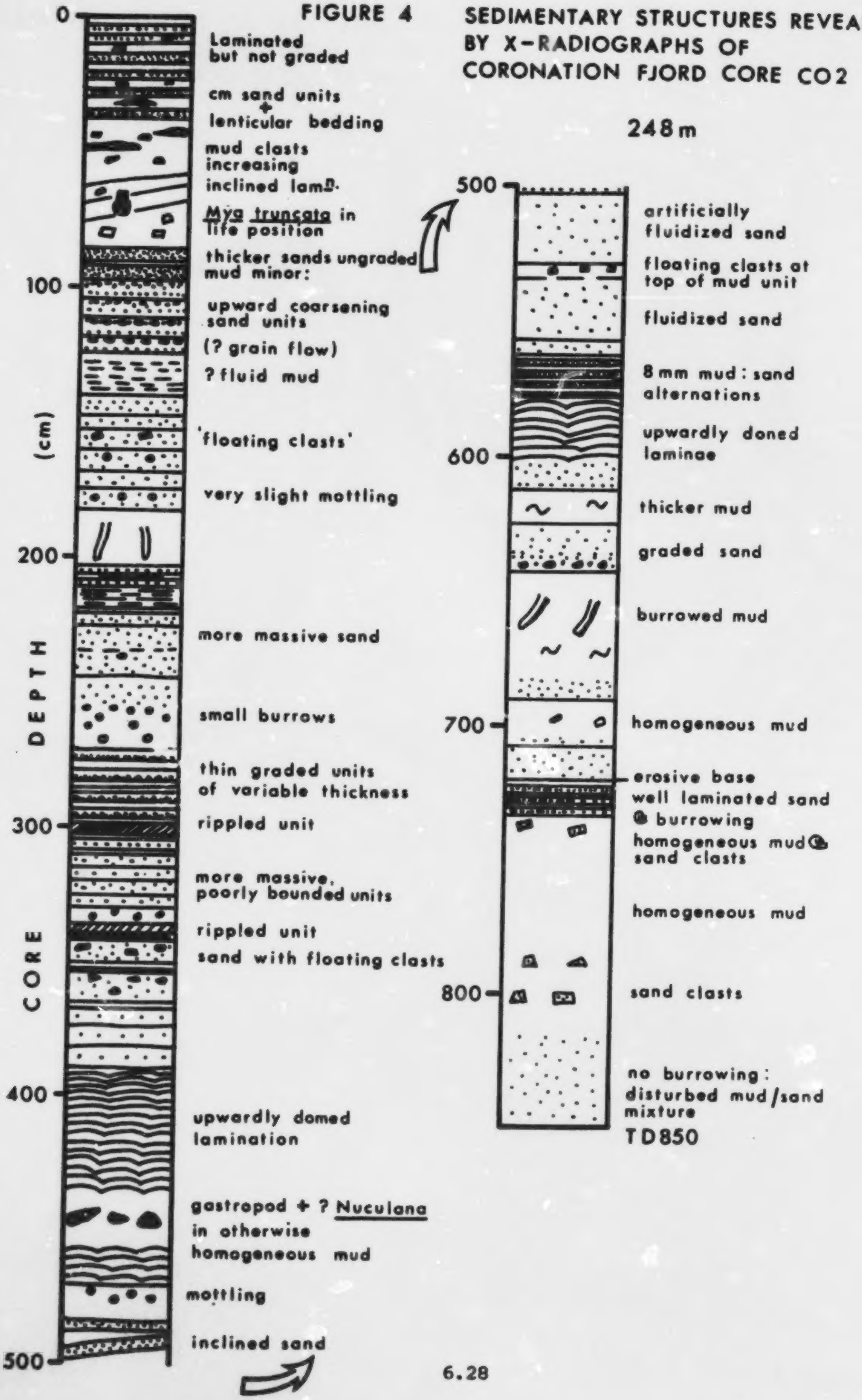

248 m
CORE DEPTH (cm)
0
100
200
300
400
500
Laminated but not graded
cm sand units + lenticular bedding
mud clasts increasing
inclined lamⁿ.
Mya truncata in life position
thicker sands ungraded mud minor:
upward coarsening sand units
(? grain flow)
? fluid mud
'floating clasts'
very slight mottling
more massive sand
small burrows
thin graded units of variable thickness
rippled unit
more massive, poorly bounded units
rippled unit
sand with floating clasts
upwardly domed lamination
gastropod + ? Nuculana in otherwise homogeneous mud
mottling
inclined sand
500
600
700
800
artificially fluidized sand
floating clasts at top of mud unit
fluidized sand
8 mm mud : sand alternations
upwardly doned laminae
thicker mud
graded sand
burrowed mud
homogeneous mud
erosive base
well laminated sand
@ burrowing
homogeneous mud@ sand clasts
homogeneous mud
sand clasts
no burrowing : disturbed mud / sand mixture
TD850

FIGURE 5 SEDIMENTARY STRUCTURES REVEALED BY X-RADIOGRAPHS OF CORONATION FJORD CORE CO4

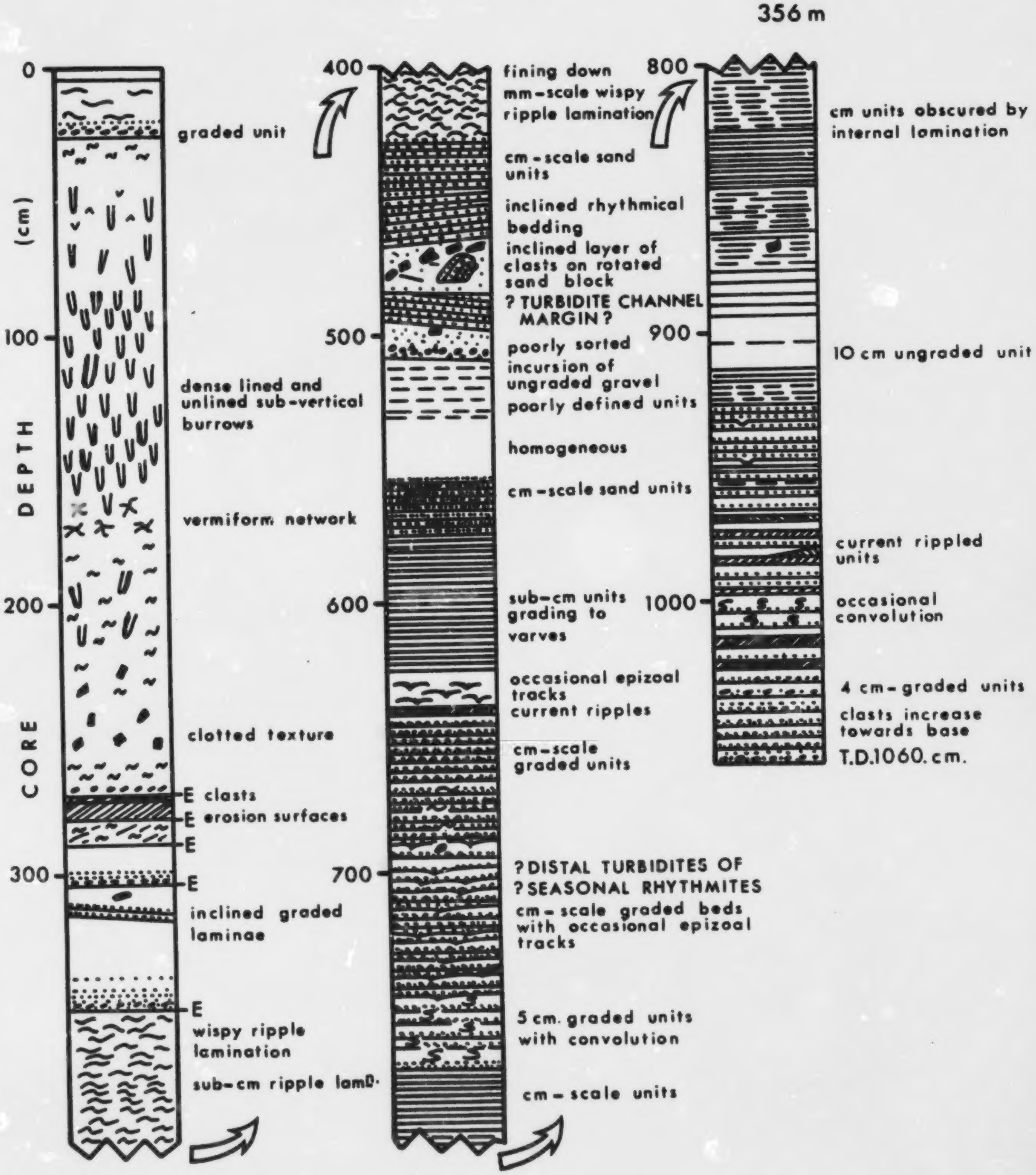

356 m
CORE DEPTH (cm)
0
100
200
300
graded unit
dense lined and unlined sub-vertical burrows
vermiform network
clotted texture
E clasts
E erosion surfaces
E
E
inclined graded laminae
E
wispy ripple lamination
sub-cm ripple lamn.
400
500
600
700
fining down mm-scale wispy ripple lamination
cm-scale sand units
inclined rhythmical bedding
inclined layer of clasts on rotated sand block
? TURBIDITE CHANNEL MARGIN ?
poorly sorted incursion of ungraded gravel
poorly defined units
homogeneous
cm-scale sand units
sub-cm units grading to varves
occasional epizoal tracks
current ripples
cm-scale graded units
?DISTAL TURBIDITES OF ?SEASONAL RHYTHMITES
cm-scale graded beds with occasional epizoal tracks
5 cm. graded units with convolution
cm-scale units
800
900
1000
cm units obscured by internal lamination
10 cm ungraded unit
current rippled units
occasional convolution
4 cm-graded units
clasts increase towards base
T.D.1060. cm.

FIG. 6

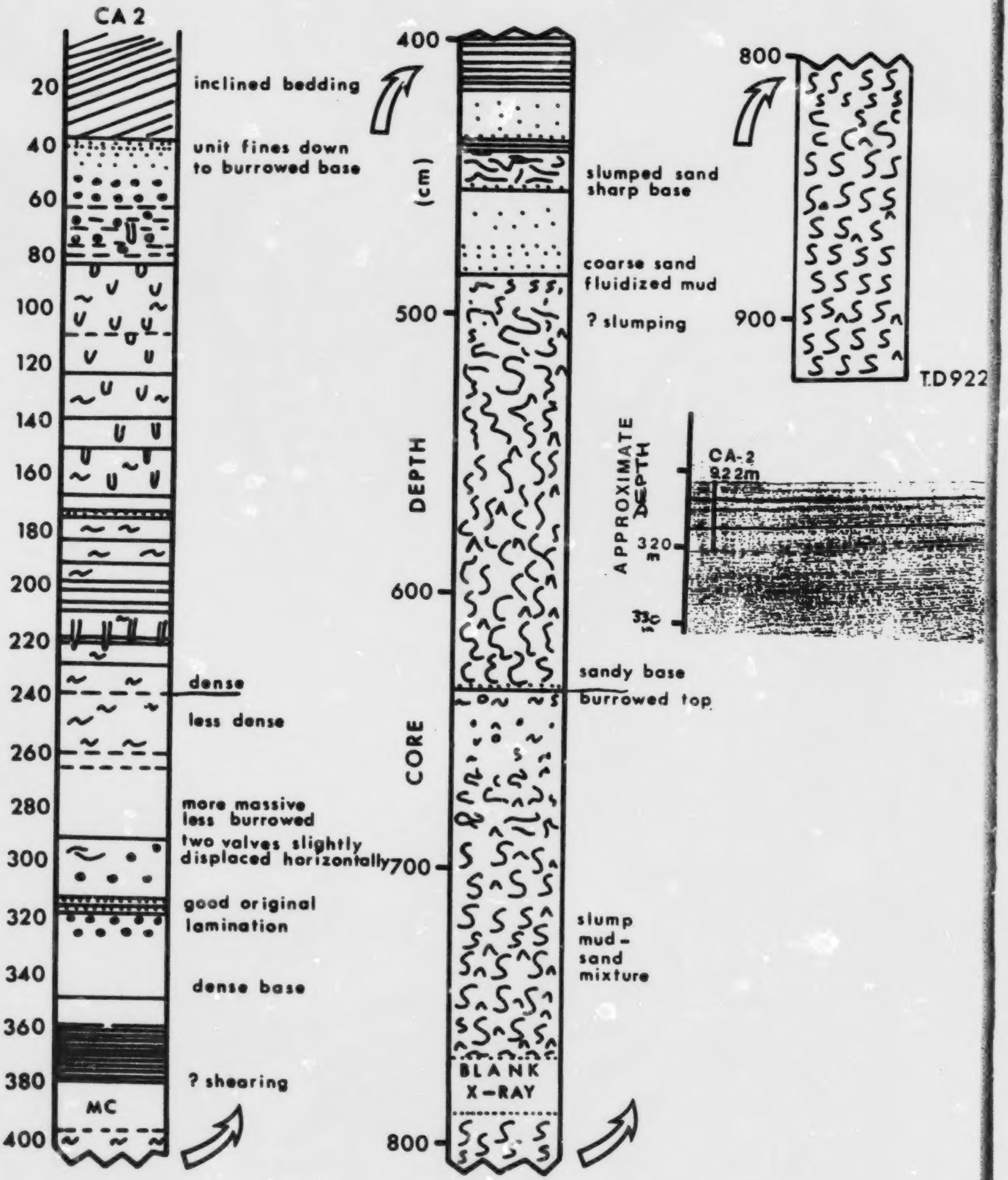

CA 2
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
inclined bedding
unit fines down
to burrowed base
dense
less dense
more massive
less burrowed
two valves slightly
displaced horizontally
good original
lamination
dense base
? shearing
MC
400
500
600
700
800
DEPTH (cm)
CORE
slumped sand
sharp base
coarse sand
fluidized mud
? slumping
sandy base
burrowed top
slump
mud -
sand
mixture
BLANK
X-RAY
800
900
T.D 922
APPROXIMATE DEPTH
CA-2
922m
320
m
330
m

FIG. 7

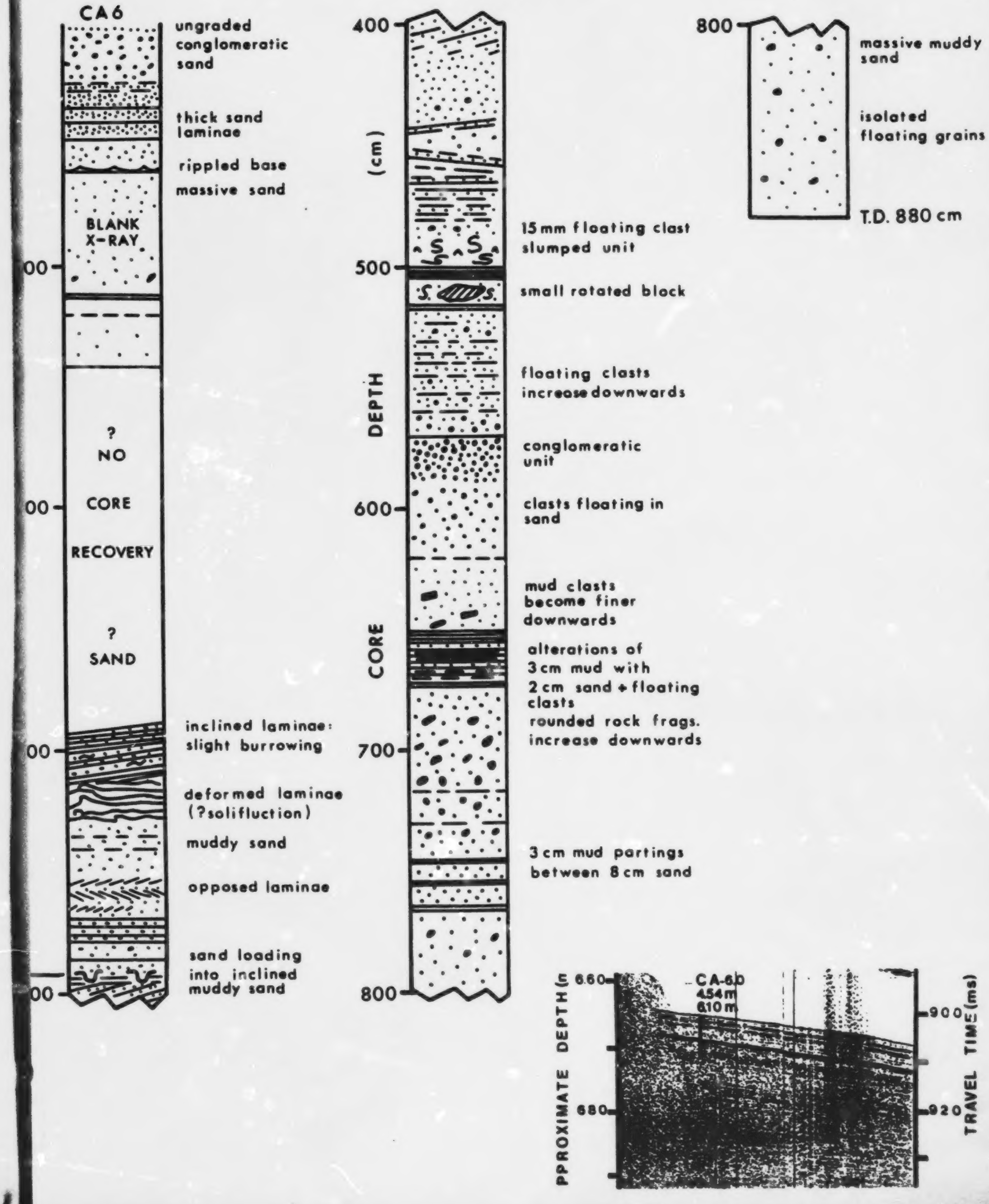
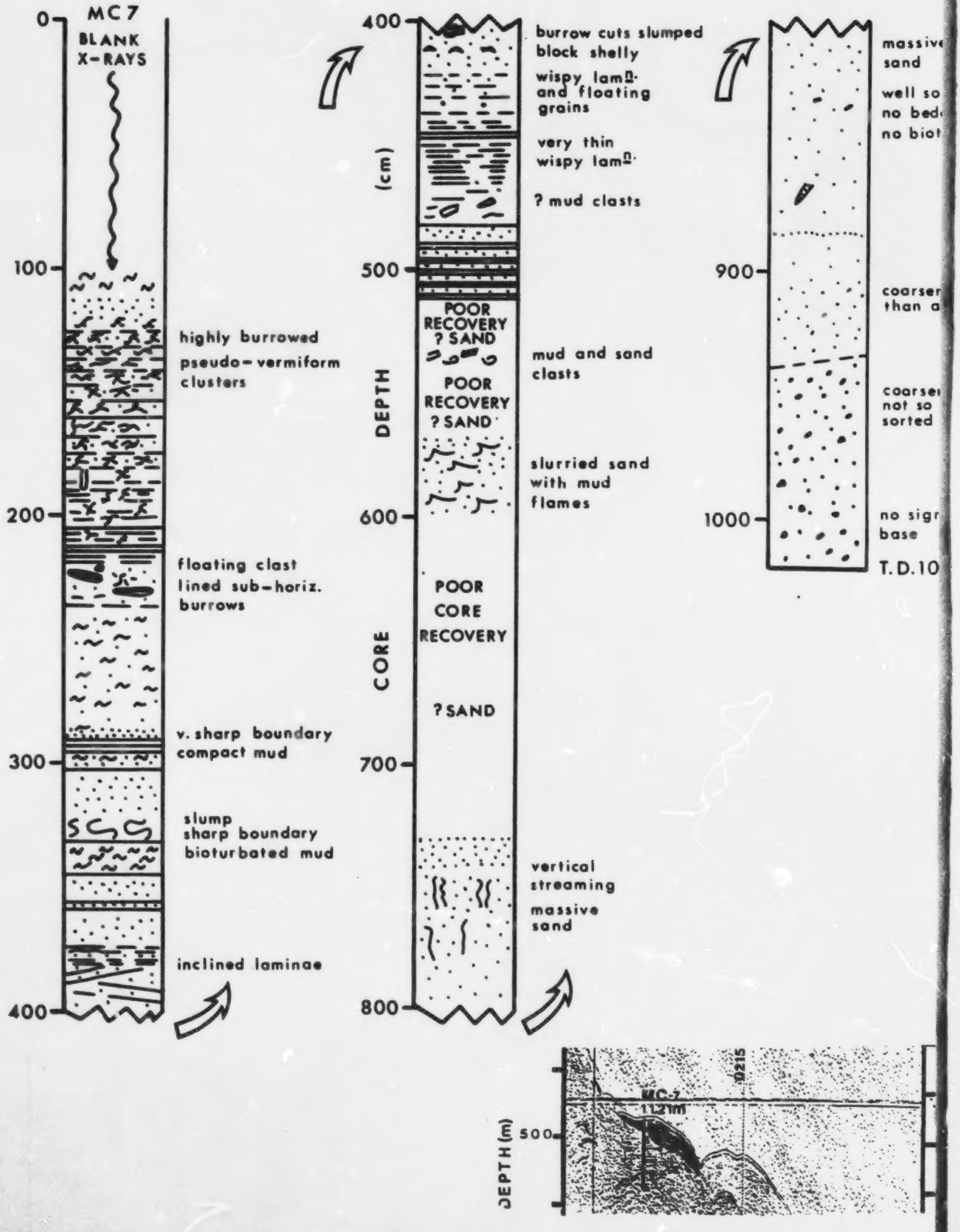
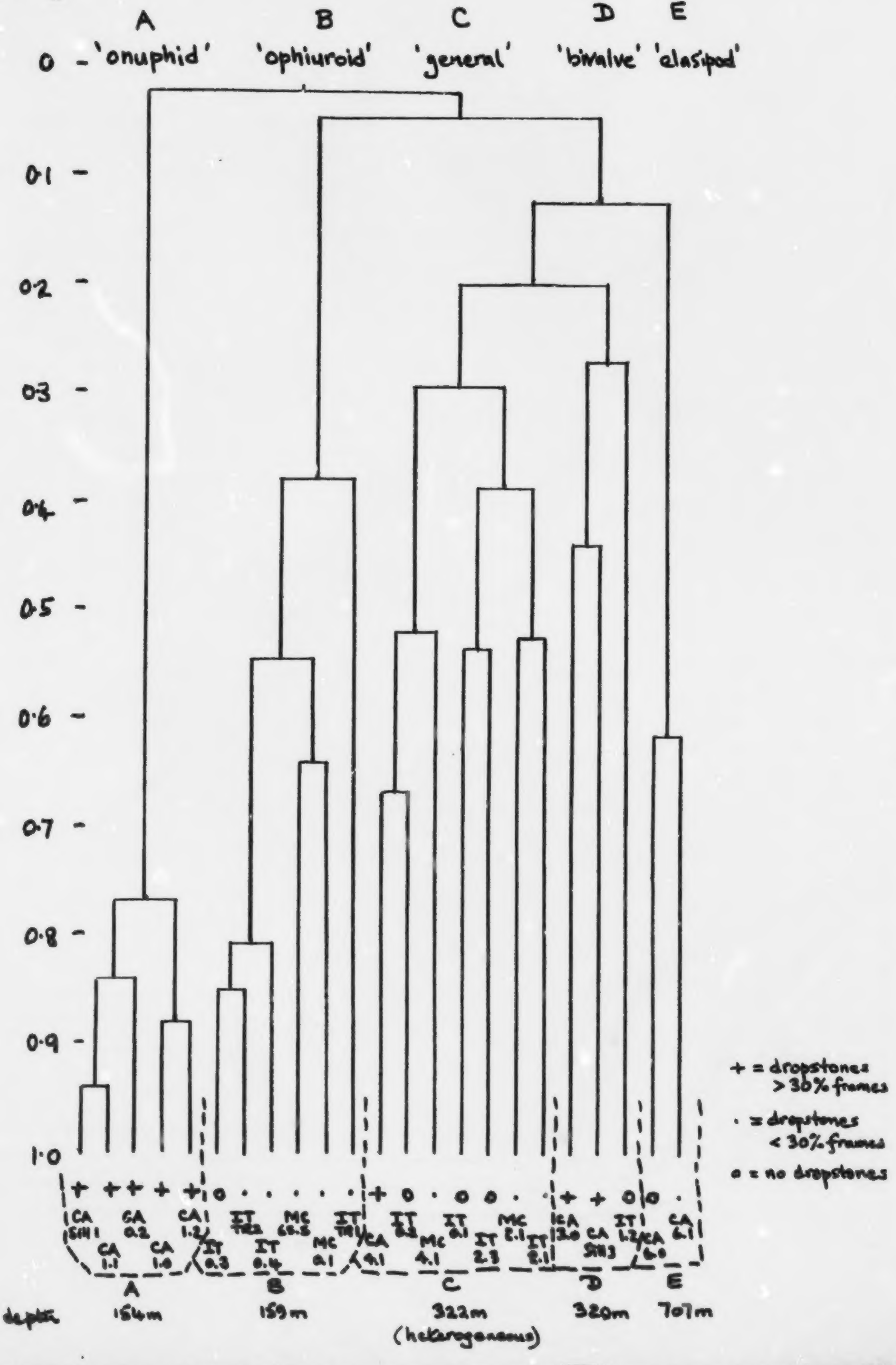

CA6
ungraded conglomeratic sand
thick sand laminae
rippled base
massive sand
BLANK X-RAY
00
? NO CORE RECOVERY ? SAND
00
inclined laminae: slight burrowing
00
deformed laminae (?solifluction)
muddy sand
opposed laminae
sand loading into inclined muddy sand
00
400
(cm)
DEPTH
CORE
15 mm floating clast
slumped unit
500
small rotated block
floating clasts increase downwards
conglomeratic unit
600
clasts floating in sand
mud clasts become finer downwards
alterations of 3 cm mud with 2 cm sand + floating clasts
rounded rock frags. increase downwards
700
3 cm mud partings between 8 cm sand
800
800
massive muddy sand
isolated floating grains
T.D. 880 cm
PPROXIMATE DEPTH (m
660
680
CA-60
454 m
610 m
900
920
TRAVEL TIME (ms)

FIG 8


MC7
BLANK X-RAYS
0
100
200
300
400
highly burrowed
pseudo-vermiform clusters
floating clast
lined sub-horiz. burrows
v. sharp boundary
compact mud
slump
sharp boundary
bioturbated mud
inclined laminae
DEPTH (cm)
CORE
400
500
600
700
800
burrow cuts slumped block shelly
wispy lamⁿ. and floating grains
very thin wispy lamⁿ.
? mud clasts
POOR RECOVERY ? SAND
mud and sand clasts
POOR RECOVERY ? SAND
slurried sand with mud flames
POOR CORE RECOVERY
? SAND
vertical streaming
massive sand
900
1000
massive sand
well so
no bed
no biot
coarser than a
coarser not so sorted
no sign base
T.D.10
0215
MC-7
1121m
DEPTH (m)
500

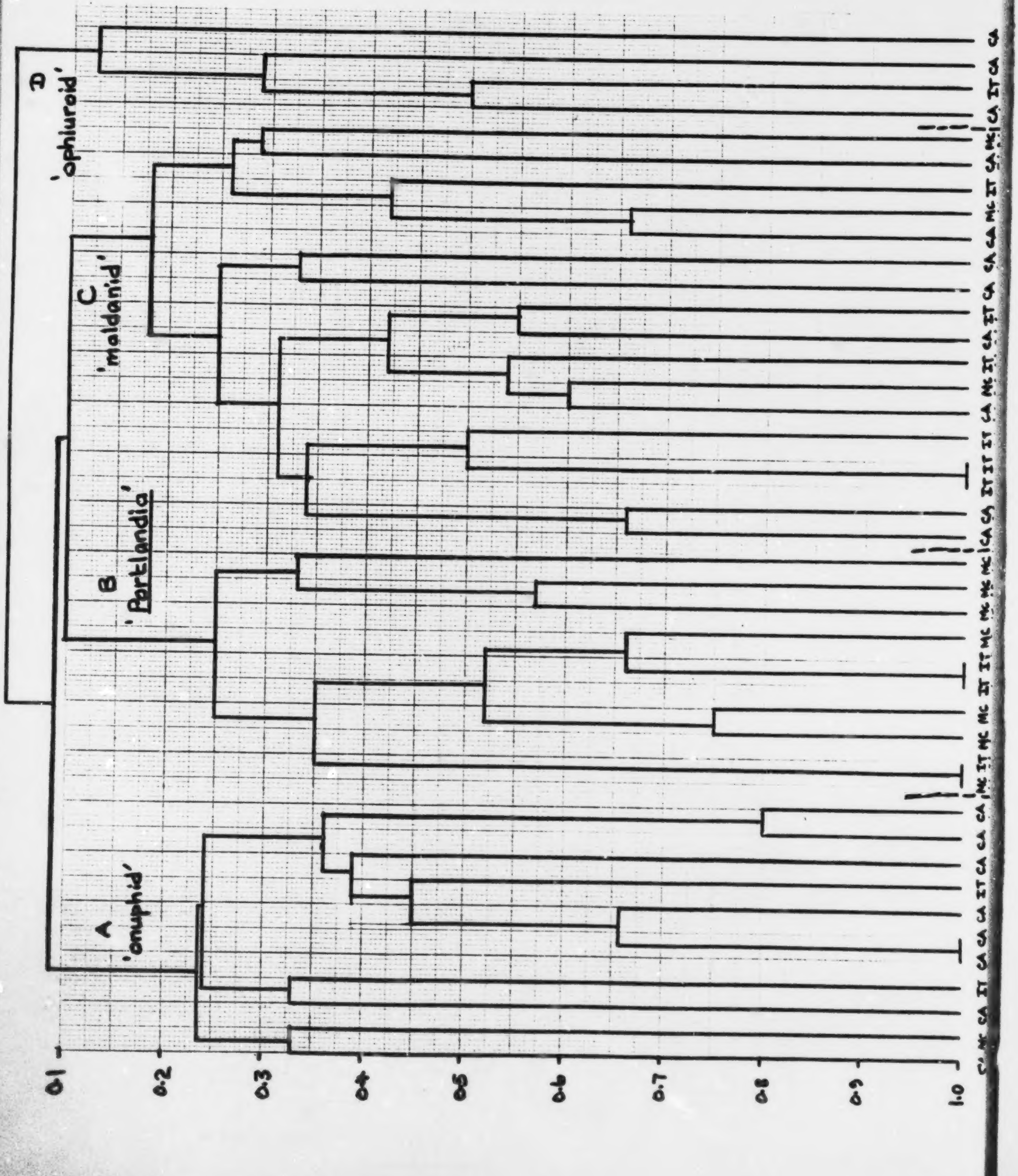
CZEKANOWSKI : UNDERWATER PHOTO GROUPINGS

Figure 9



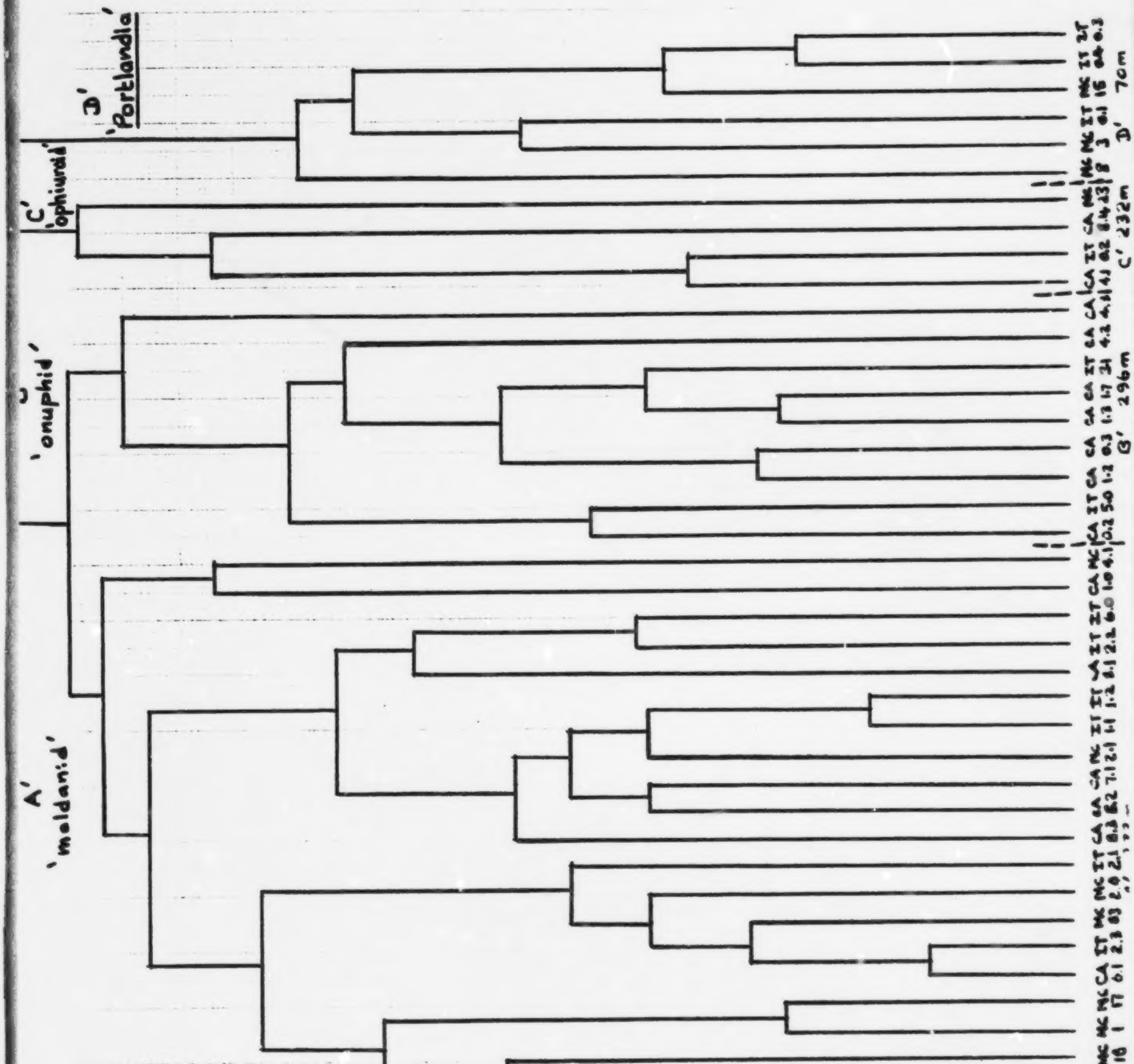
JACCARD: GRAB SAMPLE GROUPINGS

Figure 10



CZEKANOWSKI : GRAB SAMPLE GROUPINGS

Figure 11



CHAPTER 7

SAFE: 1983 HUDSON Bottom Grab Samples

by

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Objectives

1. To provide primary and supplementary information for geophysical studies and benthic investigations.

2. To ascertain the primary properties (grain size and mineralogy) and associate organic parameters.

METHOD

Grab samples were collected at most stations using a 40 X 40cm Van Venn^R or Shipek^R sampler. Three subsamples were taken from the surface layer (i.e. upper two to three cm of sediment) and one from the subsurface layer if the sample was not homogeneous. The surface subsamples were designated for foram, sedimentology and heavy mineral research. The subsurface sample was used strictly for sediment property analysis. Macrofauna samples were separated out of the grab and with the foram subsample treated with formalin (pH = 8.3). The remainder of the sample was used to fill a 4-L plastic bag/bucket. Sediment color and sediment texture were described within minutes of the sample retrieval.

Size frequency distributions were obtained from all samples. The gravel fraction was separated from the finer fraction using a standard 2mm sieve. The sand fraction was separated from the mud using a 53 μm wet sieve. The sand fraction when greater than 4% by weight was analyzed for its equivalent spherical sedimentation diameter at 1/5 interval using the computerized Atlantic Geoscience

Centre settling tube. The mud fraction was analyzed on a computerized sedigraph^R 5000D for the particles equivalent spherical sedimentation diameters at 1/50 interval over the range of 0.5μm tc 63μm. The results of the gravel, sand and mud analyses were overlapped with program MERGE and the moment statistics and computer plots were generated with program READY.

All bottom grab samples were subsampled for carbon determinations. Apprroximately 1-2 grams of sample were oven-dried and ground to a fine powder prior to weighing. This was to allow for replicate determinations. Samples of 250mg were accurately weighed into sample crucibles. For determinations of total carbon, samples were moistened with a few drops of deionized water and dried. This procedure "cakes" the sample to the bottom of the crucible and eliminates loss during combustion due to the high flow of oxygen in the combustion cylinder. For analyses of organic carbon, samples were digested with 1N hydrochloric acid to remove carbonates and other inorganic carbon. The residual HCl was removed from the samples with successive washings using deionized water. Samples were then analyzed on a Leco model/ WR-12 Carbon Determinator equipped with a Leco induction furnace. The percentage of carbon is displayed on a direct reading digital display. Detection limits of the WR-12 in the high range (0.010 to 5.000% C) is 0.002 or 1% of the reading, whichever is greater; and in the low range (0.0050 to 0.200% C) 0.005 or 1% of the reading, whichever is greater. The instrument is calibrated using a 1 gram iron ring reference standard. Since all samples are 1/4 the weight of a standard, the digital display readings for all samples are multiplied by a factor of 4.

Washed subsamples were size fractionated by wet sieving (53 μm and 25 μm screens) and settling into 4 fractions >53 μm, 25-53 μm, 2-25 μm, and <2μm. The fractions were mounted onto 10mm Ag-filters (Syvitski and Bayliss, 1980) and run at 40KV and 20MA at 1° per minute on a X-ray diffractogram. Peak areas were digitized and the relative percentage calculated. This data report has not massaged the peak area percentages in terms of the intensities of identifier peaks or the Lorentz polarization factors.

In the laboratory, the wet volume of each foram subsample was measured by displacement and the material was then stained using a heated, saturated solution of Sudan Black B (Waker et al., 1974). After 30 minutes of staining, the sample was washed through a 63 μm sieve with alcohol and dried. The dried residue was floated in a 10:4 mixture of bromoform and acetone to separate the foraminifera (Gibson and Walker, 1967).

FORAMINIFERAL ASSEMBLAGES: CAMBRIDGE, ITIRBILUNG AND MCBETH FIORDS

Sediment samples were collected for benthonic foraminifera and thecamoebian analysis at 86 stations during the 1983 field program; about half of these (40) are located in Cambridge Fiord. 53 stations occur in less than 100 m water depth and are situated generally in prodelta environments near the head of each fjord.

The largest number of foraminifera species was observed in the Cambridge Fiord material (130 foraminifera and 4 thecamoebian species). Itirbilung and McBeth samples contained 69 foraminifera and 54 foraminifera plus one thecamoebian species respectively. Planktonic species are present as far up fiord as station 0.1 in Itirbilung and 5 BWD in Cambridge; there were no planktonic species observed in the 1983 sample suite from McBeth fiord.

In Cambridge Fiord, the average absolute abundance of foraminifera (expressed as the total number of tests per cc of wet sediment - TN/CC) for the <100 M sample suite is comparable to 1982 results determined from the relatively deep fjord basin environments (139 in 1983 vs. 140 in 1982). In Itirbilung and McBeth however, the TN/CC for the <100 M deep samples is significantly lower than that observed in the respective offshore environments of each fjord. The difference is greatest in Itirbilung; the 1983 value is 11 versus 137 for 1982 samples. In McBeth Fiord the 1983 and 1982 TN/CC's are 31 and 99 respectively. The spatial distribution of TN/CC in the 1983 <100 m suite is heterogeneous in all cases i.e., coefficients of variation (defined as V = standard deviation/mean x 100%) range between 100% and 200%. Exceptionally high TN/CC values ($\geq$200) were observed at stations 18 and 19 in McBeth Fiord and at stations 13H, 7H and 12H in Cambridge Fiord.

CALCAREOUS SPECIES

Compared to 1982 values, the percentage of calcareous species in the total population of the 1983 <100 m deep samples is substantially lower in Itirbilung (0.8% vs. 31%) and is somewhat reduced in McBeth (15% vs. 26%). In Cambridge Fiord, the mean percentage of calcareous taxa in the 1983 <100 m deep suite is 27% versus 15% recorded for the 1982 deep water set. The distribution of total calcareous species percentages in the <100 m samples shows about the same degree of spatial "patchiness" as was observed in the TN/CC distributions. V values range between 100% and 200%; the highest V's are associated with the lowest 1983 percentage values (e.g., Itirbilung Fiord). The spatial distribution of calcareous species total percentages is about the same in Cambridge and McBeth fjords (V = 125% and 120% respectively).

In general, living calcareous foraminifera absolute abundance results (LN/CC) from the 1983 samples suggest that comparatively large populations inhabit shallow fjord head prodelta environments in Cambridge and McBeth but are restricted to deeper offshore environments in Itirbilung.

For the shallow prodelta category, the richest calcareous assemblage occurs in Cambridge Fiord where average living species diversity and maximum species diversity reach 4.8 and 15 respectively. Mean living species diversity is lowest in Itirbilung Fiord prodelta environments (<1.0 species per sample) and intermediate (≈3.0) near the head of McBeth.

Prominent living calcareous prodelta species noted in Cambridge Fiord include *Haynesina germanica*, *Buccella frigida*, *Eoponidella pulchella* and *Cibicides lobatulus*. In terms of total population results, *H. germanica* and *B. frigida* appear to reflect an ultra proximal prodelta assemblage while *Cassidulina reniforme* and *C. lobatulus* show a comparatively distal distribution. The mean total calcareous species diversity in the prodelta environment of Cambridge Fiord is 8.6 and the highest total calcareous species diversity occurs at station 9 BWD adjacent to the northwest delta.

Important living calcareous species observed in McBeth Fiord include *Elphidium excavatum clavata*, *Islandiella helenae* and *Quinqueloculina seminulum*. These taxa also characterize the prodelta total calcareous species assemblage along with *Virgulina fusiformis* and *Cassidulina reniforme*. The mean total calcareous species diversity near the head of McBeth Fiord is 4.0; the most diverse total calcareous assemblage occurs at station 9 in an embayment on the south shore of the fjord.

The total calcareous assemblage near the head of Itirbilung Fiord is comparatively impoverished. Mean diversity is 1.5 and many of the samples contain no calcareous specimens. *Elphidium bartletti* is a prominent taxon at station 3 on the fjord head delta foreslope.

ARENACEOUS SPECIES

Nearshore living arenaceous species assemblages are comparable generally to those observed in deeper basin environments during the 1982 expedition. *Textularia earlandi* and *Thurammina faerleensis* are common near the head of Itirbilung and McBeth fjords. *Textularia torquata*, *Spiroplectammina biformis* and *Reophax arctica* occur in comparatively large numbers near the head of Cambridge but are replaced by *T. earlandi*, *Trochammina nana* and *T. faerleensis* in the deeper offshore areas of that fjord. At the head of Itirbilung and McBeth fjords, *T. earlandi* and *T. faerleensis* are prominent members of the total arenaceous assemblage. *T. torquata* and *S. biformis* are well represented in the total population near the head of Cambridge Fiord.

In terms of the overall benthonic foraminifera population distribution (i.e., total calcareous plus total arenaceous species), there are 11 taxa that appear to be common to McBeth and Cambridge, 19 species that are common to Cambridge and Itirbilung, and six taxa that are common to Itirbilung and McBeth. There are 31, 8 and 9 species that appear to be unique to Cambridge, McBeth and Itirbilung fiords respectively. The majority of unique McBeth taxa are calcareous types while most of the unique Cambridge forms are arenaceous.

Grain Size Data

Results from thirty three samples from 1982 and 44 samples from the 1983 cruise are provided in the report (Table 7.4). Inugsuin Fiord is noteable for its high sand content. Itirbilung has variable sand content and present in the form of a well sorted mode. Except near station MC4.1, McBeth Fiord is very fine grained. Cambridge Fiord has very poorly sorted sediment with the gravel component as high as 34%.

Mineralogy

The mineralogical differences between fjords is substantial and in many cases unique in their relative abundance of different minerals (Table 7.5). Similar variations were noted in the petrography of the sands. For example, Coronation, Maktak and North Pangnirtung fjords are neighbor inlets. Coronation is high in feldspar and low in amphibole and garnet; North Pangnirtung is much higher in amphibole and garnet; and Maktak Fiord is rich in quartz. Tingin and Itirbilung are also neighbor inlets and similar in mineralogy with a preponderance of mica. McBeth showed a clear trend down fiord with a noticeable decrease in mica content.

Carbon

With few exceptions, the carbon content of the grab samples was related to organic content (80%). Only weak trends were evident with the shelf stations having the highest carbon values. Also where the sand content of the grab sample was high, the associate carbon value is low. The surface skin of the grab sample had 20% higher carbon values (on average) than the subsurface sediment (Table 7.6).

References:

Gibson, T.G. and Walker, W. 1967. Flotation methods for obtaining foraminifera from sediment samples. Jour. Paleontology 41: 1294-1297.

Syvitski, J.P.M. and Bayliss, P. 1980. A fast technique for a low sample weight random oriented mount to be used in quantitative XRD analysis. Jour. Sedimentary Petrology 50: 624-626.

Walker, D., Linton, A.E. and Schafer, C.T. 1974. Sudan Black B: A superior stain to Rose Bengal for distinguishing living from non-living foraminifera. Jour. Foram. Research 4: 205-215.

Table 7.1

STATION NO.	1A	3	4	5	6	1	0.1	0.2	0.3	0.4	1.1	1.2	2.1	2.2	2.3	3.1	5a	6a
DEPT (M)	25	20	40	40	48	25	55	88	155	148	167	256	310	402	424	356	175	502
SPECIES TN/CC	53.21	1.90	0.11	0.11	0.09	BARREN	30.25	3.12	8.90	12.87	121.57	126.16	52.38	270.69	196.41	208.77	295.99	96.92
Centropyxis arenatus	R	R	C	C	A		R	C	X	X	X	X	X	X	X			
Hemisphaerammina bradyi	R						R	R	X	X	X	X	R	X				X
Psammosphaera fusca	X						X		X									C
Spiroplectammina biformis	C	R					R		C	C	C	R	C	C	R	C	C	R
Reophax arctica	X	X							X	X	R	R	R	R	C	C	C	R
Textularia earlandi	C	C	C	C			C	C	A	C	C	C	C	C	C	R	R	R
Thurammina faeroensis	A	A	C	C			A	A	R	R	X		R		X	X		
Elphidium excavatum clavata	X						X				R	X	X	R	X	R		
Triangular indet. sp.		X							X									
Elphidium bartletti		R															X	
Islandiella helenae		X												X	X		X	
Trochammina nana				C				C	X	X	C	C	R	C	C	C	R	R
Adercotryma glomerata					C			R			X	R	C	R	C	C	C	C
Bathysiphon hirudinea							R											
Trochammina ochracea							X										R	R
Cassidulina reniforme							X		R	X					X		X	
PLANCTONIC FORAMS							X											X
Dendrophrya arborescens									R	X		X						
Recurvoides contortus									X				X	X				
Reophax fusiformis									R	R	R	C	R	R	R	R	R	R
Reophax catenata									R	R	R	X	R	X	X		X	
Saccammina atlantica									R	R	C	R	R	R	R	R	R	R
Textularia gracillima									X	X		X		X	X	X		R
Textularia torquata									R	R	R	X	R	R	R	R	C	C
Cyclogyra planorbis									X									
Pyrgo williamsoni									X		X					X		
Silicosigmoilina groenlandica									X	R	X	R		R	R			X
Virgulina fusiformis									R	R	R	R	R	R	X			R
Cribrostomoides jeffreysi										X			X	R	X		R	R
Recurvoides turbinatus											X	R	R	R	X	X	R	X
Verneuilinoides europeum											X	X	R	R	R	R	X	R
Buliminella elegantissima											R		R	R	X			X
Triloculina oblonga											X					X		
Cassidulina teretis											R							
Dentalina frobisherensis											X							
Quinqueloculina seminulum											X							
Spiroplectammina typica												X				X	R	
Cribrostomoides crassimargo												X				X	R	X
Hemisphaerammina bateliori												R						
Hyperammina fragilis												X	X		X	X		R
Astrononion gallowayi												X						
Melonis zaandamae												X			X	X		R
Nonionella atlantica												X			X			X
Hyperammina subnodosa													X	X	X		X	X
Buccella frigida													X		X	X	X	
Nonionellina labradorica													X		X			
Robertinoides charlottensis													X	X	X			
Glomospira gordialis														X	X			
Eggerella advena														X	X	X	C	R
Trochammina quadriloba														X		R	X	R
Epistominella takayanagii														X			X	
Crithionina goesi															X			X
Crithionina pisum															X			
Thurammina compressa															X			

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.1 - 49.9%
A = 50.0 - 100%

ITIRBILUNG FJORD

Table 7.1 cont.

SPECIES STATION NO.	1A	3	4	5	6	1	0.1	0.2	0.3	0.4	1.1	1.2	2.1	2.2	2.3	3.1	5s	6s
Stetsonia horvathi															X			
Reophax gracilis																X		
Reophax scottii																X		
Nonionella digitata																X		
Hippocrepina indivisa																	X	
Hyperammina elongata																	X	
Trochammina cf. T. inflata																	X	
Cibicides lobatulus																	X	
Eoeponidella pulchella																	X	
Parafissurina lateralis																	X	
Trochammina globigeriniformis																		R
Astrononion gallowayi																		X
Astrorhiza limicola																		X
Botellina labyrinthica																		X
Hyperammina cylindrica																		X
Cribrostomoides wiesneri																		X
Reophax guttifera																		X

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

STATION NO.	21	22	23	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	20	19	18	17	0.1	2.0	2.1	4.1	83.6
DEPT (M)	6	20	30	10	16	20	20	31	40	50	5	54	52	6	12	20	32	40	50	54	42	32	20	152	320	320	549	439
SPECIES TH/CC	2.74	5.71	4.40	3.84	16.26	8.16	13.85	2.67	7.22	1.99	15.16	11.31	12.98	0.76	0.87	0.92	1.5	4.01	5.17	64.98	226.84	161.02	86.76	164.59	244.29	127.58	143.92	102.87
Centropyxis arenatus	A	C	R			X	X	C	R	C		R	R	C	R	C	C	R	R						X	X	X	
Spiroplectammina biformis	C	R	R	X	R	R	R	R		R	R	C	R			R	R	C	C	C	C	C	C	C	R	R	C	R
Psammosphaera sp.		X			R	R	R	R			R										X	X						
Thurammina faerleensis		A	A	A	A	C	A	C	C	A	C	C	A	A	A	A	C	C	R	R	R	R	X	X	R	X		R
Trochammina cf. T. inflata		X									R	X										X						
Bathysiphon alba			X		R	R	X				R			R			R											
Psammosphaera fusca			X								X	R	R			R	R	C	R				R					
Textularia earlandi			X	X	R	C	R	C	R	R		C	C	R			R	C	C	C	C	C	C	C	C	C	C	C
Textularia torquata			X				X	X		X									X	R	C	C	C	X	R	R	R	C
Virgulina fusiformis			X			X						R						X	R	R	X	X	R	R	X		R	R
Reophax dentaliniformis				X																								
Buccella frigida				X		X					C	X								R		R	X	X	X			X
Elphidiella arctica				X							X																	
Elphidium excavatum clavata				R	R	C	X	X			X	R	X	R	R			R		C	R	R	R				X	
Elphidium excavatum excavata				R	X						X													R	X			
Elphidium excavatum lidoensis				R	X		X	R	X		C	R							R				R					
Elphidium subarcticum				X							X																	
Haynesina germanica				X					X		C	X					R			X			R	X			X	X
Quinqueloculina seminulum				R		R			A	R	R	R				R				X			X					
Bathysiphon hirudinea					R	X					R																	
Triangular indet. sp.					X	R	X	X		X		R	R					R	X				X					X
Reophax catenata						X		R				R	X					R	R	R	R		X		X	X	R	X
Patearis hauerinoides						X																						
Glandulina landeal							X			X																		
Pyrgo williamsoni							X		X			X																
Reophax arctica								X											X	X	X	R	R	R	R	R	R	R
Saccammina sphaerica								R		R												X						
Islandiella helenae								R	X			R	X					R	R	R	X	R	R	R		X		
Silicosigmoilina groenlandica									X											X				X	X	R	R	R
Cribrostomoides jeffreysi										R									R			X	R		X	X	R	
Trochammina nana										R						R	X		X	X	R	R	R	C	C	C	R	R
Hemisphaerammina bradyi											R	X	X	R				R		X	X		X	R	X	X	X	X
Cassidulina reniforme												R	X						R	R		R	X	X	R	X		X
Astrononion gallowayi												X						R					X					
Dendrophrya arborescens														R													X	
Pseudopolymorphina novangliae															R			X	X				X					
Cribrostomoides crassimargo																		X				X	R			X	X	
Cibicides lobatulus																		X	R									
Reophax fusiformis																			R	R	R	X	R	R	R	R	R	R
Reophax scottii																			X									X
Saccammina atlantica																			R	X	X	X	R	R	C	R	R	R
Trochammina macrescens																			X									
Glomospira gordialis																				X								
Pelosina didera																				X								
Recurvoides turbinatus																						X		X	R		R	
Cyclogyra planorbis																							X					
Textularia gracillima																							X		R	R		
Adercotryma glomerata																								X	R	R	R	C
Buliminella elegantissima																								X	X		X	X
Epistominella takayanagii																								X				X
Virgulina concava																								X	X	R	X	
Thurammina papillata																									X			
Verneuilinoides europeum																									X	X	X	X
Dentalina frobisherensis																									X			
Trochammina ochracea																										X		X

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.1 - 49.9%
A = 50.0 - 100%

MCBETH FJORD 83028 FORAMINIFERA

Table 7.2 cont.

SPECIES STATION NO.	21	22	23	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	20	19	18	17	0.1	2.0	2.1	4.1	83.6
Trochammina globigeriniformis																										X		
Triloculina oblonga																										X		
Esosyrinx curta																											X	
Islandiella norcrossi																											X	
Eggerella advena																											X	X
PLANKTONIC FORAMS																											X	
Bolivina pseudopunctata																												R
Nonionellina labradorica																												X
Hyperammina fragilis																												X
Ammodiscus gullmarensis																												X
Hyperammina subnodosa																												X

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.1 - 49.9%
A = 50.0 - 100%

STATION NO.	3 BMD	4 BMD	1 BMD	11 BMD	5 BMD	6 BMD	9 BMD	8 BMD	2 BMD	4H	6H	2H	3H	9H	13H	8H	1H	5H	7H	10H	11H	12H
DEPT (M)	0	0	1	4	14	23	26	29	1	10	14	16	18	20	22	30	34	50	50	60	80	80
SPECIES TM/CC	0.11	5.69	3.16	39.9	6.04	34.71	5.84	2.76	BARREN	51.04	82.96	145.97	130.67	43.38	350.16	115.06	221.16	86.72	574.42	266.60	296.01	606.66
Centropyxis arenatus	A	R	R	R	A	R	C	A								X		X				
Adercotryma glomerata	C									X	R	X	X	X	R	R	R	C	C	C	C	C
Spiroplectammina biformis	C	X			R	X	R			A		C	A	R	C	C	C	C	C	C	C	C
Textularia earlandi		X					X	R				X			R	X	X		X		X	X
Trochammina nana		X	R							X	R	X	X	R	R	R	R	R	R	C	R	R
Saccammina atlantica		X									R	R	R	X	R	X	X	R	X	X	R	R
Thurammina faerleensis		X	R			X	X	R		X	R	R	X	X	X		X	X	X		X	X
Elphidium excavatum clavata		X				C	R				X		R	X	R	R	R		X	X	X	R
Eoponidella pulchella		R									R			R	X	R		R	X	X		X
Hemisphaerammina bradyi		R	X	R		R	A			X	X		X				X	X				X
Buccella frigida		R	R	X	X	C	R	C			R	R	R	C	R	R	R	X	X	R		X
Psammosphaera fusca		X																				
Haynesina germanica		A	A	A		C	R	C				X										
Cyclogyra foliacea		X														X						
Elphidium frigidum		X				R																
Cyclogyra planorbis		X														X		X				
Silicosigmoilina groenlandica			R			X										X	R	R	X	X	X	X
Trochammina rotaliformis			R				X															
Cyclogyra involvens				X										X								
Trochammina ochracea					X					R	R	R	R	R	R	R	X		X	X	X	
PLANKTONIC FORAMS					R									X	X	X						X
Difflugia capreolata					R		R															
Textularia torquata						X	X			R	C	R	C	X	C	C	C	C	C	C	C	C
Cribrostomoides crassimargo						X	X			R	C	R	R	R	R	R	R	R	R	R	R	X
Elphidium subarcticum						C	X				X	X		X		X						
Elphidium bartletti						R																
Elphidiella arctica						X																
Cribrostomoides jeffreysi							X															
Centropyxis excentricus							R															
Pontigulasia compressa							X															
Haynesina orbiculare							X															
Recurvoides turbinatus										X	R	R	R	R	R	R	R	R	R	R	R	R
Reophax arctica										R	C	R	R	X	R	R	C	R	R	X	R	C
Reophax fusiformis										R	C	C	R	R	R	R	R	R	R	R	R	R
Verneuilinoides europeum										X	R	R	R	X	R	R	R	X	R	R	R	X
Trochammina cf. T. inflata											X											
Astrononion gallowayi											R	R	X	R	R	R	X		X	R		
Cibicides lobatulus											X	R		C	R	C		X	X	R	X	X
Islandiella helenae											R	R	X		X	R		X	X	R	X	R
Ammodiscus gullmarensis											R	X	X	X	X	X	X		X	X	X	X
Nonionellina labradorica											X	X			X	R						
Virgulina concava											X	R			X		X	X	X			X
Cassidulina reniforme											R	R		C		R		X	X			
Glomospira gordialis											R	R		X	X	X		R	X		X	
Saccammina sphaerica											R		X			X	X	R	X		X	X
Nonionella atlantica											X	X			X							X
Melonis zaandamae												X		X			X		X			
Virgulina fusiformis												R	X		R	R		X		X	X	X
Reophax catenata												X			X	X	X			X	X	
Quinqueloculina seminulum												X		X								
Bathysiphon filiformis												X										
Bathysiphon hirudinea												X										
Stetsonia horvathi													X	X								
Crithionina pisum													X		X			X		X		X
Hyperammina subnodosa													X		X		X	X		X	X	X
Trochammina quadriloba														X	X						R	X

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

CAMBRIDGE FJORD

Table 7.3 cont.

SPECIES STATION NO.	3 BWD	4 BWD	1 BWD	11 BWD	5 BWD	6 BWD	9 BWD	8 BWD	2 BWD	4H	6H	2H	3H	9H	13H	8H	1H	5H	7H	10H	11H	12H
Turrispirillina arctica														X								
Robertinoides charlottensis														R	X	X			X		X	X
Spiroplectammina typica														X						X		X
Trochammina nitida														X		X			X			
Patellina corrugata														X						X		
Hyperammina fragilis														X				X	X	X		X
Hyperammina elongata														X		X				X		
Discorbis translucens														R								
Eponides bradyi														X								
Fissurina marginata														X								
Gordiospira arctica														R								
Glabratella wrightii														X								
Pseudopolymorphina novangliae														X								
Quinqueloculina vulgaris														X						X		
Rosalina floridana														R								
Spirillina vivipara														X								
Discorbis squamata															X							
Quinqueloculina agglutinata															X					X		
Bolivina pseudopunctata															R	X					X	
Hyperammina cylindrica															X							
Rhabdammina discreta															X							
Epistominella takayanagii																X						
Pelosina didera																	X					
Triangular species, indet.																			X		X	
Pullenia bulloides																			X			
Buliminella elegantissima																		X				X
Crithionina goesi																		R				X
Crithionina pisum hispida																		X			R	X
Textularia gracillima																			X			
Reophax guttifera																			X			
Dendrophrya arborescens																			X			
Trochammina bullata																			X			
Dentalina pauperata																				X		
Laryngosigma hyalascidia																				X		
Pyrgo subsphaerica																				X		
Eggerella advena																					X	
Islandiella norcrossi																					X	
Pyrogo williamsoni																					X	X
Tritaxis atlantica																					X	
Scutuloris tegminis																						X
Ammotium cassis																						
Recurvoides contortus																						
Trochammina globigeriniformis																						
Hemisphaerammina batalleri																						
Reophax nodulosa																						
Tholosina vesicularis																						
Dentalina ittai																						
Saccammina sphaerica catenula																						
Astrorhiza arenaria																						
Astrorhiza limicola																						
Saccorhiza ramosa																						
Tolypammina schaudinni																						
Planispirinoides bucculentus																						
Glomospira charoides																						
Reophax adunca																						
Reophax difflugiformis																						

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

CAMBRIDGE FJORD

Table 7.3 cont.

SPECIES STATION NO.	3 BMD	4 BMD	1 BMD	11 BMD	5 BMD	6 BMD	9 BMD	8 BMD	2 BMD	4H	6H	2H	3H	9H	13H	8H	1H	5H	7H	10H	11H	12H
Trochammina macrescens																						
Cassidulina teretis																						
Pateoris hauerinoides																						
Thurammina papillata																						
Dentalina frobisherensis																						
Haplophragmoides bradii																						
Reophax scottii																						
SPP. INDET.																						
Rhizammina algaeformis																						
Rhizammina indivisa																						
Rhabdammina abyssorum																						
Botellina labyrinthica																						

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

CAMBRIDGE FJORD

Table 7.3 cont.

STATION NO.	0.2	0.3	1.0	1.2	1.3	1.4	1.5	1.7	2.2	4.1	4.2	4.3	6.1	3-1 SILL	3-2 SILL	3-3 SILL	3-4 SILL	3-5 SILL	7.1
DEPT (M)	125	200	181	190	240	218	262	310	292	520	513	560	750	397	327	322	292	225	660
TN/CC	358.40	258.33	365.26	261.47	105.14	113.84	147.93	165.37	371.01	160.73	89.16	200.78	100.50	225.00	413.85	591.27	353.71	286.64	181.97
SPECIES																			
Centropyxis arenatus																			
Adercotryma glomerata	C	C	C	C	C	C	C	C	C	R	C	C	R	R	C	C	C	C	R
Spiroplectammina biformis	C	C	C	C	C	R	R	R	R	R	C	R	X	R	R	R	C	C	R
Textularia earlandi	X	R	X	R	R	R	R	R	R	C	R	C	C	C	C	C	C	R	C
Trochammina nana	C	R	R	C	C	C	C	C	C	C	R	C	R	C	C	C	C	C	C
Saccammina atlantica	R	R	R	R	R	R	C	R	R	R	R		R	R	R	R	R	R	R
Thurammina faerleensis	X	X				X	X			X	R	R	R	X	R	R		X	X
Elphidium excavatum clavata	X	X	R	X		R	X	X		X		X					X		
Eoeponidella pulchella	X															X			
Hemisphaerammina bradyi		X	X	R		X			X	X	X	X	X	R	X	X	X	X	X
Buccella frigida		X												X		X			
Psammosphaera fusca															X	X		R	
Haynesina germanica																X			
Cyclogyra foliacea																		X	
Elphidium frigidum																			
Cyclogyra planorbis																			
Silicosigmoilina groenlandica	X	X		R	X	X	X	R		X	X	X	X	X	R	R	R	X	
Trochammina rotaliformis																			
Cyclogyra involvens																			
Trochammina ochracea	X	X													X	X			
PLANKTONIC FORAMS					X				X		X	R	X			X		X	X
Difflugia capreolata																			
Textularia torquata	C	C	C	R	C	C	C	C	R	R	R	R	R	R	R	R	R	R	R
Cribrostomoides crassimargo	X	R	X	R	R	R	R	X	X	R	R	R	R	X	X	X	X	R	
Elphidium subarcticum									X								X		
Elphidium bartletti																			
Elphidiella arctica																			
Cribrostomoides jeffreysi	R	R	R	R	R	R	R	R	R	R	R	R	X	R	R	R	R	R	X
Centropyxis excentricus																			
Pontigulasia compressa																			
Haynesina orbiculare																			
Recurvoides turbinatus	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Reophax arctica	R	C	C	R	R	R	R	R	R	X	R	X	X	R	R	R	R	R	R
Reophax fusiformis	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Verneuilinoides europeum	R	R	R	X	R	X	R		X	R	R	X		X	X	X	X		X
Trochammina cf. T. inflata	X								X	R		R	R	X	R	R	R	R	R
Astrononion gallowayi	X	X	X	X		X	X		X								X		X
Cibicides lobatulus	X	X		X			X	X		X		X		X	X	X	X		
Islandiella helenae	X								X										
Ammodiscus gullmarensis	X	X	R		R	X	X	R	X	X	X		X	X		X	X	X	
Nonionellina labradorica		X												X					X
Virgulina concava		X		X					X								X	X	
Cassidulina reniforme		X				X	X									X			X
Glomospira gordialis				X	X		R		X	X	X	R			X	X	X	X	
Saccammina sphaerica				X					R				X	X		X			
Nonionella atlantica						X	X		X			R		R		X			
Melonis zaandamae	X	X	X	X		R	X	X	R	X		R	X	X	X	R	R	X	X
Virgulina fusiformis	X		X			X	X	X						X	X	R	X		
Reophax catenata			X				X		X						X			X	
Quinqueloculina seminulum					X														
Bathysiphon filiformis														X					
Bathysiphon hirudinea																			
Stetsonia horvathi		X										X				X			X
Crithionina pisum							X			X		X		X		X			
Hyperammina subnodosa																X			
Trochammina quadriloba	X	X	X	X	X	R	X	X	R	R	R	R	R	R	R	R	R	R	R

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

SPECIES STATION NO.									2.2	4.1	4.2	4.3	6.1	SILL	SILL	SILL	SILL	SILL	7.1
Textularia gracillima	X	X	X	X	X	X	X	X	X	R	R	R	R	R	R	R	R	X	R
Reophax guttifera		X																	
Dendrophrya arborescens				X								X			X		X	X	
Trochammina bullata										X	R		R						
Dentalina pauperata																			
Laryngosigma hyalascidia																			
Pyrgo subsphaerica																			
Eggerella advena																			
Islandiella norcrossi																			
Pyrgo williamsoni			X						X								X		
Tritaxis atlantica						X		X		X		R		X				X	
Scutuloris tegminis																			
Ammotium cassis				X															
Recurvoides contortus				X	R	X	X	X	X		R	X			X	X	X	R	
Trochammina globigeriniformis				X	X		X		R	X		X	R	R	R	R	R	R	X
Hemisphaerammina bataileri						X	X	X											
Reophax nodulosa							X	X		X									
Tholosina vesicularis							X			X						X		X	
Dentalina ittai								X											
Saccammina sphaerica catenula									X			X	X		X	X	X	X	X
Astrorhiza arenaria										X		X	X				X		
Astrorhiza limicola										X		R	R	X	X	X	X	X	X
Saccorhiza ramosa										R		X	X		X				X
Tolypammina schaudinni										X									
Planispirinoides bucculentus										X									
Glomospira charoides											X								
Reophax adunca											X								
Reophax difflugiformis											X								X
Turrispirillina arctica	X																		
Robertinoides charlottensis			X											X	X				X
Spiroplectammina biformis							X												
Trochammina nitida									X	X	X		X		X		X	X	
Patellina corrugata									X										
Hyperammina fragilis											X		X	X	X	X	X	X	X
Hyperammina elongata														X		X	X	X	
Discorbis translucens																			
Eponides bradyi																			
Fissurina marginata																			
Gordiospira arctica																			
Glabratella wrightii																			
Pseudopolymorphina novangliae																			
Quinqueloculina vulgaris																			
Rosalina floridana																			
Spirillina vivipara																			
Discorbis squamata																			
Quinqueloculina agglutinata																			
Bolivina pseudopunctata	X	X	X			R	R	R											X
Hyperammina cylindrica								X				X			X	X	X	X	
Rhabdammina discreta															X			X	
Epistominella takayanagii																			
Pelosina didera																			
Triangular species, indet.																			
Pullenia bulloides																			
Buliminella elegantissima	X	R	R	X		R	X	X				X				X			X
Crithionina goesi				X		X													
Crithionina pisum hispida							X												

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

Table 7.3 cont.

CAMBRIDGE FJORD

SPECIES / STATION NO	0.2	0.3	1.0	1.2	1.3	1.4	1.5	1.7	2.2	4.1	4.2	4.3	6.1	3-1 SILL	3-2 SILL	3-3 SILL	3-4 SILL	3-5 SILL	7.1
Trochammina macrescens											X	R	X	R	X	R	X	X	X
Cassidulina teretis												X							
Pateoris hauerinoides													X						
Thurammina papillata													X						
Dentalina frobisherensis																X		X	
Haplophragmoides bradii																X			
Reophax scottii																	X		
SPP. INDET.																	X		
Rhizammina algaeformis																		X	
Rhizammina indivisa																		X	
Rhabdammina abyssorum																			X
Botellina labyrinthica																			

X = 0.1 - 0.9%
R = 1.0 - 9.9%
C = 10.0 - 49.9%
A = 50.0 - 100%

TABLE 7.4 GRAIN SIZE DATA

GRAB SAMPLES	SIZE FRACTIONS (%)					MOMENT STATISTICS (ø)			
Sample ID	Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
SU-1-surf	0.0	9.3	90.6	50.9	39.6	7.1	2.2	-.6	3.3
SU-1-sub	0.0	8.0	91.9	51.2	40.7	7.2	2.0	-.3	2.3
SU-8-sur	35.2	61.3	3.4	1.8	1.6	.5	2.8	.0	2.3
MA-6A-surf	0.0	7.7	92.2	52.7	39.5	7.1	2.1	-.6	3.3
MA-6A-sub	0.0	7.0	92.9	52.9	40.0	7.1	2.0	-.3	2.3
MA-7-surf	0.0	8.8	91.1	47.4	43.7	7.2	2.2	-.6	2.8
MA-7-sub	0.0	6.0	93.9	49.9	43.9	7.3	2.1	-.3	2.3
TI-1A-surf	0.0	43.9	56.0	32.7	23.3	5.4	2.6	.4	1.8
TI-1A-sub	0.0	50.3	49.6	31.6	17.9	5.0	2.5	.7	2.2
TI-2-surf	0.0	28.9	71.0	38.9	32.1	6.1	2.7	-.0	1.7
TI-2-sub	0.0	13.7	86.3	46.7	39.5	7.0	2.3	-.2	2.1
TI-3-surf	0.0	4.8	95.1	40.1	55.0	8.0	2.2	-.6	3.3
TI-3-sub	0.0	4.4	95.5	37.6	57.8	8.2	2.3	-.5	2.9
TI-6-surf	0.0	4.0	95.9	30.1	65.7	8.8	2.5	-.7	3.1
TI-6-sub	0.0	4.9	95.0	32.0	63.0	8.6	2.5	-.6	2.7
CL-3-sub	1.0	5.8	93.1	50.8	42.3	7.4	2.7	-.6	4.1
CL-7-sub	0.5	10.3	89.1	48.1	41.0	7.0	2.4	-.7	3.6
IN-1-surf	0.0	14.9	85.0	54.8	30.1	6.5	2.3	-.2	2.4
IN-2-surf	0.0	35.0	64.9	37.8	27.0	5.8	2.6	.1	1.8
IN-2-sub	0.0	53.1	46.8	29.6	17.1	4.6	2.7	.6	2.1
IN-3-surf	0.0	22.5	77.4	40.4	37.0	6.5	2.7	-.4	2.0
IN-3-sub	0.0	43.1	56.8	34.4	22.4	5.1	2.9	.2	1.7
IN-4-surf	0.0	30.8	69.2	41.1	28.0	6.0	2.5	.1	1.7
IN-4-sub	0.0	33.4	66.5	40.6	25.9	5.7	2.8	.0	1.7
IN-5-surf	0.0	51.6	48.3	34.9	13.3	4.7	2.3	.8	2.7
IN-5-sub	0.0	41.9	58.1	42.8	15.2	5.2	2.2	.8	2.5
IN-6-surf	0.0	4.5	95.4	33.2	62.1	8.3	2.3	-.7	3.4
IN-6-sub	0.0	9.7	90.2	38.7	51.5	7.5	2.3	-.8	3.1
IN-7-surf	0.0	26.7	73.2	45.7	27.5	6.0	2.5	.1	1.9
IN-7-sub	0.0	30.0	69.9	45.6	24.2	5.8	2.4	.2	2.0
IN-8-sub	0.0	13.0	86.9	51.4	35.5	6.8	2.3	-.2	2.2
CA-9-surf	0.0	.7	99.2	53.3	45.9	7.7	1.8	-.1	2.0

Table 7.4

			SIZE FRACTIONS (%)				MOMENT STATISTICS (ϕ)			
Sample ID		Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
- 1983 -										
IT 0.1	sur	-	30.12	69.88	47.91	21.96	5.96	2.54	0.76	2.55
	sub	-	77.77	22.23	15.79	6.44	3.82	2.01	2.49	8.90
0.2	sur	-	34.44	65.56	51.86	13.70	5.34	2.09	1.18	3.61
	sub	-	53.80	46.20	37.80	8.40	4.62	2.02	1.80	5.89
0.3	sur	-	5.90	94.10	47.86	46.24	7.89	2.50	0.01	2.07
	sub	0.10	16.83	83.07	44.53	38.54	7.20	2.75	0.13	2.02
0.4	sur	-	11.33	88.67	45.62	43.05	7.54	2.65	-0.06	2.16
	sub	-	14.84	85.16	47.40	37.76	7.17	2.64	0.25	1.92
1.1	sur	0.40	17.35	82.25	38.85	43.40	7.28	3.00	-0.32	2.45
	sub	0.10	24.57	75.33	35.85	39.48	6.86	3.08	-0.09	1.95
1.2	sur	0.30	7.55	92.15	42.22	49.93	7.87	2.57	-0.46	3.22
2.1	sur	-	69.53	30.47	16.08	14.39	4.29	2.75	1.41	3.76
	sub	-	58.15	41.85	21.05	20.80	4.96	3.10	0.94	2.50
2.2	sur	-	24.48	75.52	38.01	37.51	6.86	3.12	0.06	1.88
2.3	sur	-	12.06	87.94	45.15	42.78	7.34	2.34	-0.29	2.45
3.1	sur	-	73.78	26.22	12.30	13.92	4.05	2.72	0.150	4.01
	sub	0.80	71.00	28.20	13.08	15.12	4.20	3.01	1.28	3.84
5	sur	0.20	74.48	25.32	21.31	4.01	3.65	1.73	1.50	7.22
6	sur	-	41.43	58.57	40.97	17.60	5.35	2.36	0.77	2.54
	sub	-	42.21	57.79	37.40	20.39	5.49	2.61	0.82	2.59
MC 0.1	sur	0.91	4.21	94.88	44.71	50.17	7.92	2.37	-1.07	6.18
2.0	sur	0.27	4.56	95.17	44.53	50.64	7.87	2.22	-0.73	4.47
2.1	sur	-	5.93	94.07	52.42	41.65	7.51	2.23	0.06	2.29
4.1	sur	-	60.71	39.29	28.54	10.75	4.48	2.21	1.48	4.41
	sub	-	50.29	49.71	33.14	16.57	5.07	2.69	1.10	3.17
83.6	sur	-	6.11	93.89	45.79	48.10	7.74	2.15	-0.45	3.28
	sub	-	6.54	93.46	42.13	51.33	7.87	2.27	-0.38	2.91
CA 0.2	sur	0.50	32.06	67.44	52.57	14.87	5.30	2.45	-0.12	2.73
0.3	sur	2.83	18.26	78.91	46.16	32.75	6.38	3.35	-0.68	3.26
1.0	sur	0.80	23.66	75.54	49.26	26.28	5.94	3.01	-0.47	2.61
1.2	sur	1.62	24.08	74.30	44.14	30.16	6.03	3.14	-0.59	2.73
1.3	sur	1.30	17.68	81.02	42.36	38.66	6.69	3.14	-0.77	3.19
1.4	sur	3.73	16.94	79.33	38.38	40.95	6.70	3.78	-0.78	2.97
1.5	sur	0.62	17.61	81.77	43.73	38.04	6.78	3.05	-0.50	2.82
1.7	sur	7.66	19.16	73.18	34.35	38.83	6.10	4.14	-0.72	2.66
	sub	0.40	17.24	82.36	39.87	42.50	7.01	3.02	-0.56	2.76
2.2	sur	0.71	23.27	76.02	42.18	33.85	6.30	3.15	-0.31	2.41
3 #1	sur	10.10	9.35	80.55	42.06	38.50	6.47	4.18	-0.89	3.25
#2	sur	2.60	17.69	79.71	45.59	34.12	6.62	3.32	-0.37	3.21
#3	sur	9.65	17.84	72.51	35.64	36.87	6.08	4.35	-0.63	2.59
#4	sur	6.60	22.85	70.54	35.51	35.04	5.88	3.94	-0.60	2.65
#5	sur	11.60	29.13	59.26	30.47	28.79	5.19	4.38	-0.29	2.31
4.1	sur	33.56	17.38	49.06	23.24	25.82	3.56	5.18	0.12	1.52
	sub	1.27	16.87	81.86	38.91	42.95	6.97	3.23	-0.69	3.09
4.2	sur	0.00	76.03	23.97	14.07	9.90	3.78	2.50	1.79	5.38
	sub	0.00	84.46	15.54	9.50	6.04	3.26	2.13	2.29	8.42
4.3	surf	4.10	26.25	69.65	34.74	34.91	6.22	3.74	-0.41	2.66
6.1	surf	0.42	2.57	97.01	46.99	50.02	8.00	2.26	-0.56	4.63
7.1	surf	0.02	6.28	93.70	38.66	55.04	8.29	2.64	-0.37	2.42

TABLE 7-5 RELATIVE MINERAL ABUNDANCES
(Peak Area %)

Sample ID	Size Fraction (µm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
IN-1-sur	25-53	62.7	-	10.5	10.7	40.6	-	-
	2-25	63.4	-	-	4.9	31.5	-	-
	<2	85.4	-	-	-	8.1	6.4	-
IN-2-sur	25-53	25.9	-	29.4	13.4	31.1	-	-
	2-25	27.7	-	-	21.7	40.9	9.6	-
	<2	39.9	-	-	-	33.8	26.2	-
IN-2-sub	25-53	49.6	4.8	3.6	3.0	33.2	2.6	2.84
	2-25	37.0	13.7	-	10.8	38.4	-	-
	<2	49.4	5.1	9.6	2.7	14.0	19.0	-
IN-3-sur	25-53	74.9	-	6.6	6.9	11.5	-	-
	2-25	65.2	-	-	10.0	24.7	-	-
	<2	100.	-	-	-	-	-	-
IN-3-sub	25-53	51.3	-	-	12.6	35.9	-	-
IN-4-sur	25-53	70.9	-	1.9	5.3	21.7	-	-
	2-25	47.4	8.7	-	12.9	30.8	-	-
	<2	46.9	-	-	-	20.7	32.3	-
IN-4-sub	25-53	28.4	-	-	14.4	57.0	-	-
IN-5-sur	25-53	43.8	-	-	17.9	23.0	15.1	-
	2-25	29.1	-	-	9.7	61.1	-	-
	<2	21.1	-	-	-	21.1	57.6	-
IN-5-sub	25-53	61.3	-	-	18.0	33.3	-	-
	2-25	27.1	-	-	15.6	57.2	-	-
IN-6-sur	25-53	29.7	-	-	28.1	42.1	-	-
	2-25	56.7	-	-	17.1	26.1	-	-
	<2	33.4	-	-	-	34.1	32.3	-
IN-7-sur	25-53	56.2	-	-	10.1	33.6	-	-
	2-25	42.0	-	-	16.6	41.2	-	-
	<2	25.0	-	-	22.1	28.2	24.6	-
IN-8-sub	25-53	57.6	-	-	9.2	33.1	-	-

Table 7.5 Cont'd

Sample ID	Size Fraction (µm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
IN-8-sub	2-25	19.0	9.1	8.4	18.9	33.1	11.4	-
	<2	21.4	-	30.9	7.6	6.0	33.8	-
IN-4517	25-53	31.9	3.8	3.8	13.6	43.2	3.5	-
	2-25	45.5	-	10.2	6.1	35.5	2.4	-
	<2	60.3	-	-	22.6	17.0	-	-
MC-1-sur	25-53	67.0	-	10.3	9.3	13.3	-	-
	2-25	57.9	-	-	19.8	22.2	-	-
	<2	40.4	9.1	-	-	50.4	-	-
MC-1-sub	25-53	44.9	-	-	6.3	37.4	11.1	-
	2-25	52.9	7.5	6.7	12.4	17.1	-	3.4
	<2	27.0	-	-	-	36.9	36.0	-
MC-3-sur	25-53	36.6	-	10.4	9.6	43.3	-	-
	2-25	71.3	-	-	9.0	19.6	-	-
	<2	64.4	-	4.9	-	12.6	18.0	-
MC-3-sub	25-53	39.7	29.1	-	60.5	65.2	42.0	12.0
	2-25	41.1	3.1	7.0	11.6	19.9	13.5	3.5
	<2	39.4	7.4	6.9	6.6	10.5	28.9	-
MC-4-sur	25-5	41.6	-	6.1	11.2	40.9	-	-
	2-25	67.1	-	-	12.1	20.7	-	-
	<2	60.1	-	5.7	15.4	18.7	-	-
MC-4-sub	25-53	61.6	2.0	3.2	2.8	28.4	.7	1.0
	2-25	41.6	8.8	-	12.7	27.6	4.0	5.1
	<2	39.5	6.9	10.7	-	11.4	26.0	5.2
MC-5-sur	25-53	17.6	4.5	-	11.0	63.0	3.7	-
	2-25	48.1	-	-	26.3	25.5	-	-
	<2	51.1	-	8.0	16.3	24.4	-	-
MC-5-sub	25-53	33.3	-	-	30.5	36.1	-	-
	2-25	39.9	4.9	5.5	19.2	30.2	-	-
	<2	61.3	5.2	6.3	-	8.7	13.8	4.5
MC-6-sur	25-53	41.8	-	-	14.2	43.8	-	-
	2-25	37.4	5.1	14.4	17.0	25.8	-	-
	<2	31.5	-	-	-	24.0	44.4	-
MC-6-sub	25-53	45.2	-	18.2	14.1	22.3	-	-
	2-25	34.2	6.0	20.2	15.8	23.6	-	-

Table 7.5 Cont'd

Sample ID	Size Fraction (µm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
MC-6-sub	<2	30.48	12.95	16.91	-	7.52	24.43	7.73
MC-7-sur	25-53	50.36	-	-	13.74	35.90	-	-
	2-25	49.70	13.09	10.08	-	27.13	-	-
	<2	66.33	-	-	-	33.67	-	-
MC-8-sur	25-53	58.34	-	-	28.24	33.42	-	-
	2-25	27.59	-	-	28.40	44.01	-	-
	<2	35.04	-	23.72	-	13.14	28.10	-
MC-8-sub	25-53	18.52	1.86	1.86	14.08	61.12	2.60	-
	2-25	12.32	6.64	-	9.53	14.87	-	4.62
	<2	28.79	8.49	27.13	-	19.01	16.61	-
MC-9-sur	25-53	24.12	3.14	-	22.27	32.72	6.84	10.94
	2-25	29.13	6.08	9.94	13.79	36.84	-	4.25
	<2	54.91	5.97	4.78	6.10	10.75	11.68	5.84
MC-9-sub	25-53	52.53	9.69	6.06	6.50	25.22	-	-
	2-25	54.90	-	-	12.57	32.53	-	-
	<2	27.63	-	-	-	25.83	46.55	-
MC-11-sur	25-53	19.02	-	-	6.98	21.55	52.45	-
	2-25	18.55	-	4.17	25.91	42.50	8.87	-
	<2	17.50	-	3.85	22.96	42.00	2.31	-
MC-11-sub	25-53	25.75	-	2.40	6.47	46.95	11.14	7.31
	2-25	21.21	9.95	14.98	18.60	23.72	4.73	6.84
	<2	22.41	-	40.90	-	23.53	13.17	-
MC-4317	25-53	79.96	-	2.44	5.30	9.91	2.38	-
	2-25	92.90	1.17	3.14	2.79	-	-	-
	<2	73.24	-	-	-	25.63	-	-
MC4314-OC		58.78	-	8.01	9.50	16.91	6.81	-
MC4317-OC		58.94	-	-	26.48	14.58	-	-
IT-1-sur	25-53	76.72	-	5.82	1.96	15.50	-	-
	2-25	70.37	-	8.68	5.82	15.13	-	-
	<2	68.39	-	10.36	-	21.24	-	-
IT-1-sub	25-53	80.00	-	8.27	-	7.55	5.18	-
	2-25	59.46	8.55	8.80	13.98	10.86	3.10	-

Table 7.5 Cont'd

Sample ID	Size Fraction (µm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
IT-1-sub	<2	67.96	-	9.61	-	4.18	18.25	-
IT-2-sur	25-53	84.68	-	8.29	-	7.03	-	-
IT-2-sub	25-53	64.6	-	9.37	6.60	17.05	2.32	-
	2-25	67.02	0.87	10.88	3.79	14.29	3.15	-
	<2	42.62	-	-	18.62	20.47	18.29	-
IT-3-sur	25-53	65.83	-	10.26	10.95	9.70	3.25	-
	2-25	27.29	6.14	19.64	13.79	16.71	16.43	
	<2	40.94	-	-	-	28.66	30.41	-
IT-3-sub	2-25	37.26	9.27	7.42	6.84	32.48	6.27	-
IT-4-sur	25-53	62.78	5.95	12.60	-	18.67	-	-
	2-25	44.77	3.33	7.36	3.03	29.22	12.29	-
	<2	56.02	-	-	-	-	43.98	-
IT-4-sub	25-53	49.71	-	2.03	23.73	24.62	-	-
	2-25	41.46	-	-	32.49	26.05	-	-
IT-8-sur	25-53	22.65	21.10	-	15.25	33.79	7.22	-
	2-25	10.00	6.29	11.89	17.67	31.85	22.30	-
	<2	47.42	-	-	52.58	-	-	-
CL-1-sur	25-53	69.81	1.36	4.88	3.46	17.67	0.80	2.05
	2-25	28.03	4.62	14.82	11.37	28.20	5.14	7.83
	<2	36.89	6.15	8.25	7.80	15.60	18.44	6.90
CL-2-sur	25-53	36.14	3.65	2.78	10.78	39.86	2.46	4.36
	2-25	23.37	7.18	8.79	20.71	24.42	7.34	8.22
	<2	27.14	7.53	9.24	3.65	28.28	18.02	6.16
CL-3-sur	25-53	39.05	7.01	8.49	18.78	19.69	3.05	3.79
	2-25	47.79	5.20	6.83	11.33	20.25	4.50	4.12
	<2	41.83	4.31	9.13	15.21	1.09	9.76	4.69
CL-4-sur	25-53	11.05	4.14	3.90	13.15	52.80	13.81	1.18
	2-25	28.01	19.72	12.31	5.65	37.53	8.16	4.83
	<2	52.26	6.70	16.99	4.77	6.70	9.27	3.35
CL-5-sur	25-53	8.11	5.71	1.32	17.63	60.18	2.27	4.81
	2-25	5.21	3.68	4.02	2.48	42.87	6.24	21.44
	<2	33.49	15.53	8.65	13.75	10.43	9.32	8.87

Table 7.5 Cont'd

Sample ID	Size Fraction (µm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
CL-6-sur	25-53	9.83	7.94	5.06	3.28	60.02	10.62	3.28
	2-25	20.10	4.72	7.89	5.97	53.47	3.85	4.04
	<2	17.50	12.54	16.62	14.29	18.66	11.37	9.04
CL-7-sur	25-53	33.72	1.93	2.60	5.31	50.97	3.19	2.32
	2-25	44.24	2.31	9.56	3.55	32.62	3.96	3.79
	<2	8.93	16.31	12.93	13.23	22.47	15.70	9.85
CL-8-sur	25-53	10.43	2.44	6.43	2.56	74.41	1.69	2.06
	2-25	8.19	2.15	10.21	4.79	60.46	8.44	5.80
	<2	11.90	21.74	16.25	16.25	19.23	7.78	6.87
CO-1-sur	25-53	14.96	-	7.21	36.41	41.43	-	-
	2-25	49.15	-	12.34	17.33	21.19	-	-
	<2	40.86	-	27.97	8.30	8.93	13.95	-
CO-1-sub	25-53	-	-	-	35.27	64.73	-	-
	2-25	75.52	-	-	24.48	-	-	-
	<2	44.19	-	20.40	-	12.89	22.52	-
CO-2-sur	25-53	56.38	-	3.52	17.57	22.54	-	-
	2-25	27.97	-	6.74	21.63	31.69	11.97	-
	<2	43.04	-	26.01	-	14.26	16.69	-
CO-2-sub	25-53	72.69	-	3.14	13.00	7.81	3.36	-
	2-25	17.33	-	-	45.93	27.41	9.33	-
	<2	56.93	-	18.54	-	5.92	18.61	-
CO-3-sur	25-53	55.29	-	6.58	9.05	23.56	5.51	-
	2-25	15.28	-	10.47	30.79	43.47	-	-
	<2	51.83	-	13.14	-	6.85	28.19	-
CO-4-sur	25-53	28.22	-	-	44.75	24.17	-	-
	2-25	6.30	-	12.77	31.41	49.52	-	-
	<2	25.18	-	-	-	45.39	29.43	-
CO-4977	25-53	46.45	-	11.15	25.78	16.34	-	-
	2-25	16.40	-	-	44.44	39.15	-	-
	<2	37.63	-	12.47	-	18.45	31.45	-
CO-4994	25-53	22.11	10.68	-	48.42	18.80	-	-
	2-25	29.17	-	14.27	22.26	3.43	-	-
MA-1-sur	25-53	27.55	-	5.92	33.67	15.61	11.43	5.82
	2-25	24.52	-	16.62	-	58.86	-	-
	<2	49.95	-	37.69	-	12.36	-	-

Table 7.5 Cont'd

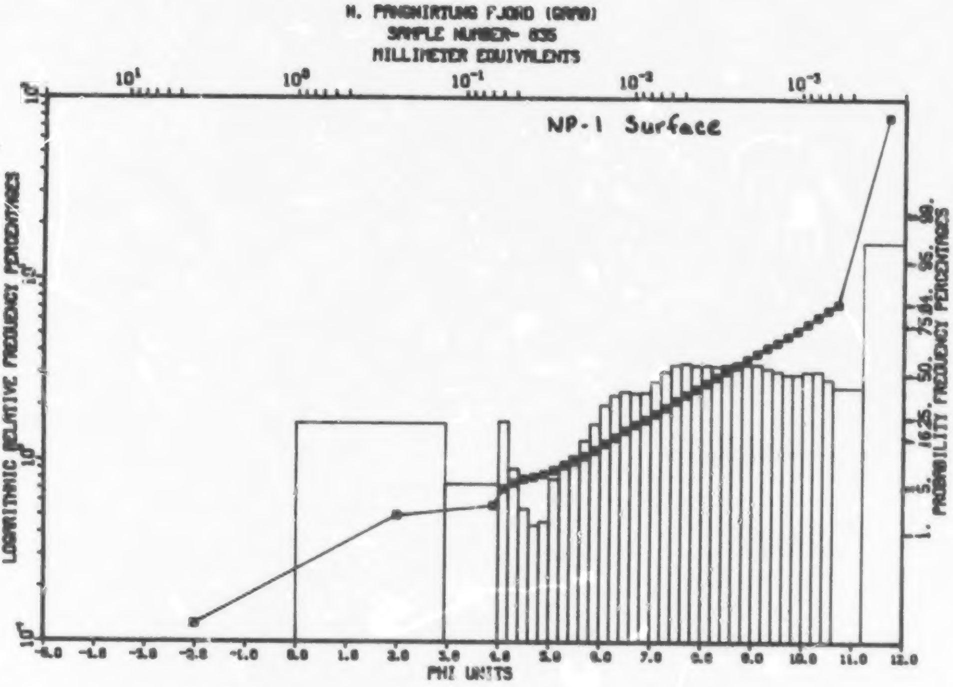
Sample ID	Size Fraction (μm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
MA-2-sub	25-53	23.41	-	-	34.84	41.75	-	-
	2-25	34.97	-	13.91	22.48	18.49	10.16	-
	<2	50.81	-	36.18	-	13.01	-	-
MA-4-OC	25-53	32.98	-	8.73	36.65	21.63	-	-
	2-25	32.75	-	13.49	19.81	25.88	8.08	-
	<2	9.03	20.83	36.81	-	-	33.33	-
Entire Sample		20.17	-	-	46.13	33.70	-	-
TI-1A-sur	<2	53.37	-	10.16	-	16.27	20.21	-
TI-1A-sub	25-53	85.93	-	3.64	3.13	7.31	-	-
	<2	75.63	-	10.61	-	5.20	8.09	-
TI-2-sur	25-53	78.79	-	-	9.04	6.65	5.52	-
TI-2-sub	25-53	35.79	-	4.61	20.57	18.95	6.61	13.47
	2-25	44.06	-	16.53	14.62	24.80	-	-
	<2	74.35	-	-	-	6.94	18.71	-
TI-3-sur	25-53	58.03	-	-	18.57	23.40	-	-
	2-25	68.18	-	6.01	10.35	15.46	-	-
	<2	57.80	-	12.34	6.96	11.98	10.93	-
TI-6-sur	25-53	17.74	6.86	25.54	27.69	22.18	-	-
	2-25	24.88	19.24	-	32.11	23.78	-	-
	<2	51.43	-	19.43	-	-	29.14	-
4913-OC		49.83	-	4.76	20.44	24.97	-	-
NP-1-sur	25-53	36.76	2.68	13.68	19.98	12.23	9.34	5.36
	2-25	20.59	9.85	12.11	23.76	22.97	6.00	4.76
	<2	23.58	13.01	12.74	13.55	9.49	22.77	5.7
NP-1-sub	25-53	49.39	2.31	1.77	20.36	17.05	6.46	2.69
	2-25	24.04	4.24	15.45	16.82	33.63	3.62	2.25
	<2	6.33	12.26	9.89	12.26	25.30	20.16	13.84
NP-2-sur	25-53	19.92	6.21	7.51	19.05	38.31	4.47	4.57
	2-25	28.12	2.68	5.05	25.15	24.16	6.54	8.32
	<2	22.21	38.50	4.67	5.02	4.22	21.87	3.53
NP-2-sub	25-53	21.86	7.45	6.86	15.12	33.61	4.89	10.24
	2-25	17.26	2.26	2.21	16.49	11.73	1.39	4.66
	<2	22.68	7.50	11.79	12.50	8.75	30.72	6.08

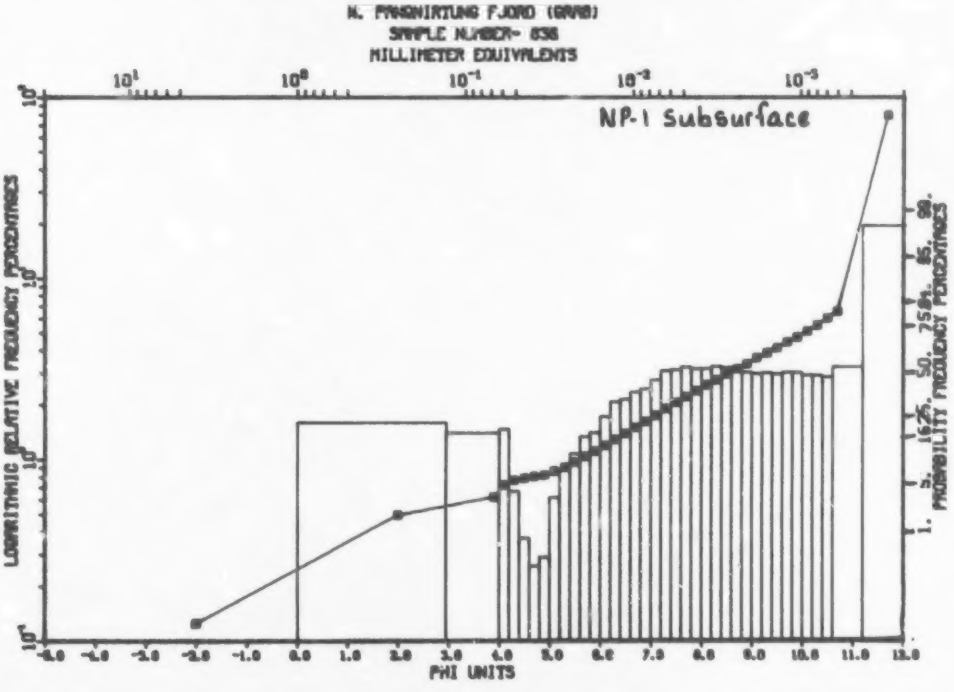
Table 7.5 Cont'd

Sample ID	Size Fraction (μm)	Mica (1.0nm)	Amphibole (0.84nm)	Chlorite (0.71nm)	Quartz (0.426nm)	Feldspar (0.32nm)	Ilmenite (0.275nm)	Garnet (0.239nm)
NP-3-sur	25-53	29.52	6.38	7.51	18.00	19.39	4.37	14.85
	2-25	15.90	5.10	16.59	21.61	24.93	7.64	8.26
	<2	19.54	11.35	12.61	14.92	8.41	26.05	7.15
NP-3-sub	25-53	16.32	2.48	7.64	40.65	24.43	4.58	3.92
	2-25	17.25	6.24	18.64	23.15	22.22	1.73	10.81
	<2	37.04	4.74	7.21	9.06	15.02	16.26	10.70
SU-1-sur	25-53	49.63	5.24	6.19	9.74	18.58	4.57	6.05
	2-25	49.43	6.33	8.15	11.92	24.17	-	-
	<2	67.37	-	11.96	15.32	5.35	-	-
SU-1-sub	25-53	37.18	-	6.68	5.73	50.41	-	-
SU-5-sur	2-25	65.52	-	9.06	7.29	15.42	2.71	-
SU-5-sub	25-53	56.13	-	-	9.98	33.89	-	-
	2-25	44.17	-	11.37	17.93	26.55	-	-
	<2	76.62	-	-	-	10.28	13.11	-
SU-6-sur	25-53	47.90	-	3.45	13.02	27.94	7.70	-
	2-25	37.98	-	-	24.71	37.31	-	-
	<2	38.89	-	5.78	-	30.00	25.33	-
SU-6-sub	25-53	78.95	-	4.11	4.18	12.76	-	-
	2-25	50.56	-	3.98	17.97	27.50	-	-
SU-7	25-53	10.97	4.36	5.35	22.22	43.88	7.74	5.49
	2-25	41.83	7.72	7.63	4.05	32.01	6.76	-
	<2	21.30	21.82	24.68	9.61	-	22.60	-
SU-7-OC		53.71	2.49	-	11.30	26.88	3.01	2.61
SU-8-sur	25-53	24.84	-	-	26.89	48.28	-	-
	2-25	18.71	20.47	23.39	18.91	18.52	-	-
	<2	32.71	-	15.58	29.28	-	22.43	-

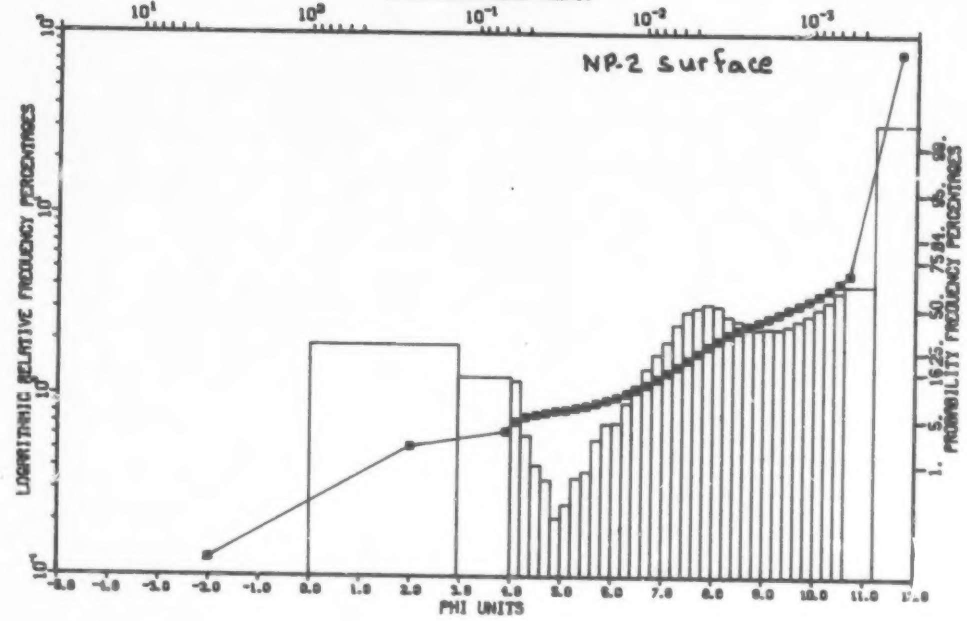
TABLE 7.6 Carbon

Station	Total Carbon(%)		Organic Carbon(%)	
	Surface	Subsurface	Surface	Subsurface
CA-0.3	0.64	0.59	0.54	0.51
CA-1.0	0.62	0.54	0.54	0.48
CA-1.2	0.55	0.58	0.51	0.54
CA-1.3	N/S	0.64	N/S	0.54
CA-1.4	0.72	0.60	0.56	0.55
CA-1.5	0.70	N/S	0.58	N/S
CA-1.6	N/S	0.66	N/S	0.59
CA-1.7	0.76	0.66	0.62	0.55
CA-2.2	0.56	0.52	0.47	0.44
CA-3-1	0.49	0.34	0.37	0.26
CA-3-2	0.42	0.46	0.30	0.34
CA-3-3	0.48	0.42	0.38	0.32
CA-3-4	0.45	0.48	0.35	0.34
CA-3-5	0.44	0.31	0.32	0.23
CA-4.1	0.58	0.44	0.41	0.38
CA-4.2	0.29	0.23	0.22	0.20
CA-4.3	0.44	0.34	0.36	0.28
CA-6.1	0.63	0.48	0.43	0.36
CA-7.1	0.83	0.63	0.57	0.40
IT-0.1	0.49	0.22	0.36	0.20
IT-0.2	0.40	0.32	0.32	0.28
IT-0.3	0.89	0.57	0.52	0.48
IT-0.4	0.54	0.51	0.41	0.43
IT-1.1	0.60	0.60	0.47	0.42
IT-1.2	0.76	0.65	0.57	0.51
IT-2.1	0.38	0.31	0.26	0.20
IT-2.2	0.75	0.65	0.56	0.59
IT-2.3	1.06	1.04	0.89	0.82
IT-3.1	0.48	0.49	0.30	0.34
IT-5.0	0.43	N/S	0.20	N/S
IT-6.0	0.98	0.92	0.49	0.58
MC 0.1	0.77	0.59	0.64	0.63
MC 2.0	0.75	0.68	0.66	0.58
MC 2.1	0.72	0.56	0.66	0.57
MC 4.1	N/S	0.22	N/S	0.18
MC 83.6	1.20	1.13	1.06	0.94

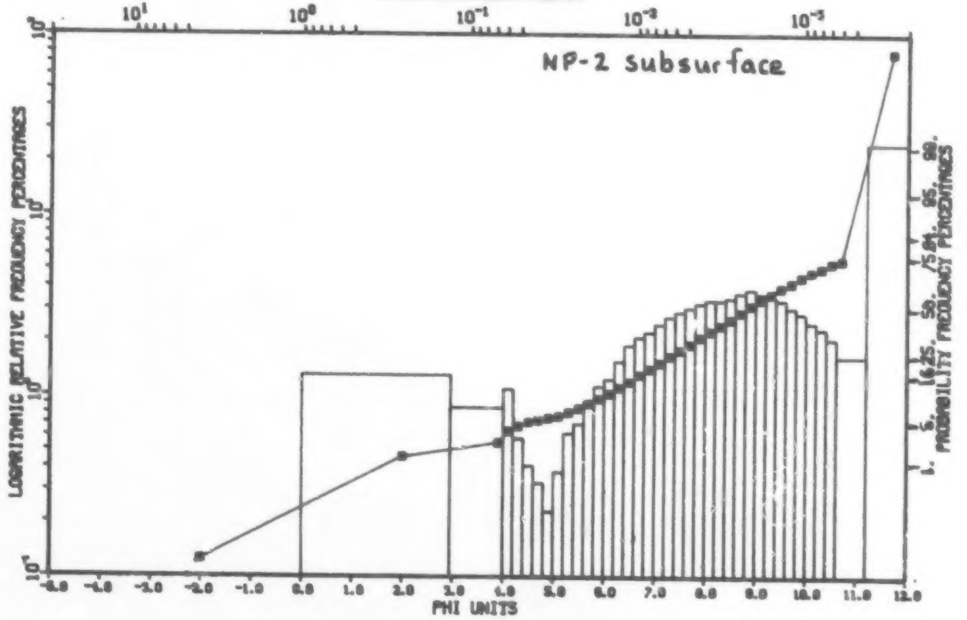

N. PANGNIRTUNG FJORD (GRAB)
SAMPLE NUMBER- 835
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
NP-1 Surface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16 25.
50.
75 84.
95.
98.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


N. PANGNIRTUNG FJORD (GRAB)
SAMPLE NUMBER- 836
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
NP-1 Subsurface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16 25.
50.
75 84.
95.
98.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

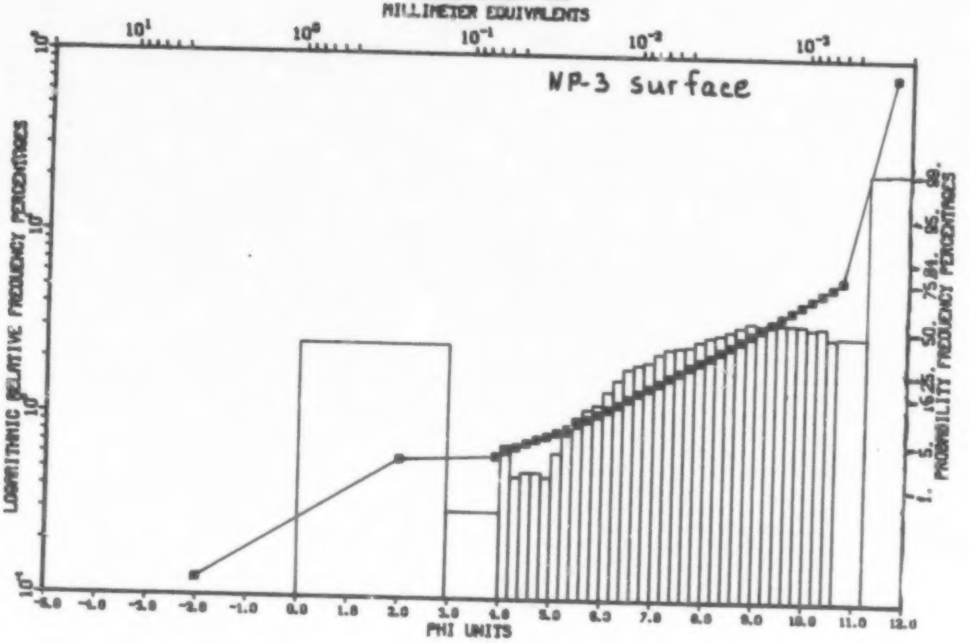
N. PANGNIRTUNG FJORD (GRAB)
SAMPLE NUMBER- 837
MILLIMETER EQUIVALENTS



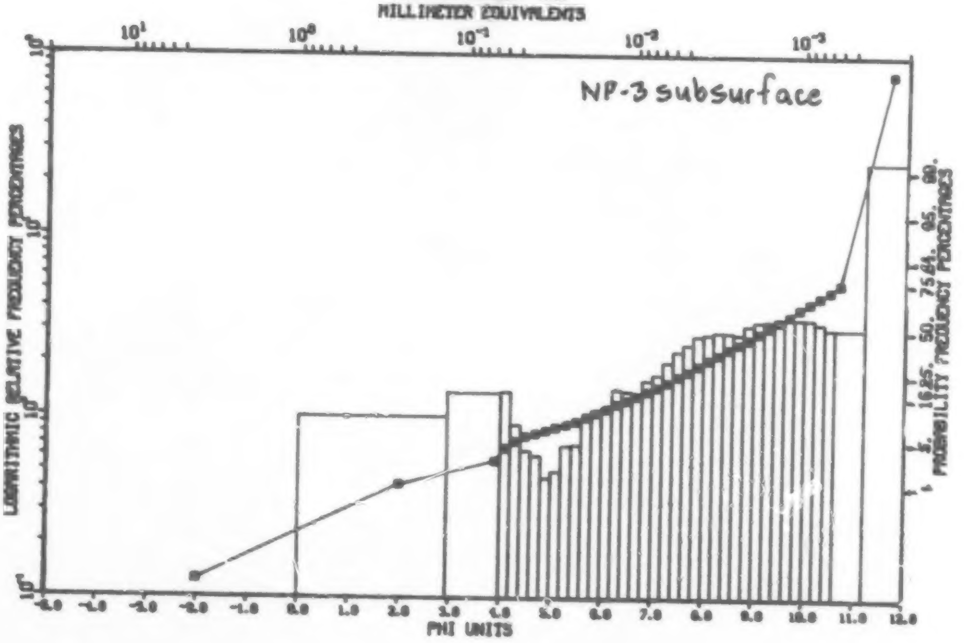
N. PANGNIRTUNG FJORD (GRAB)
SAMPLE NUMBER- 838
MILLIMETER EQUIVALENTS

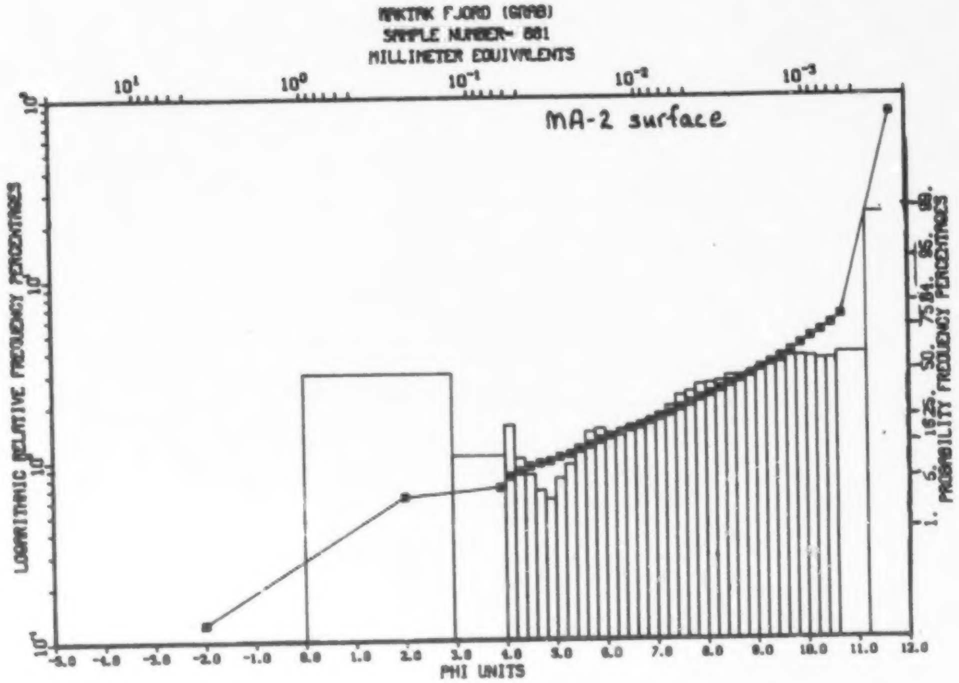


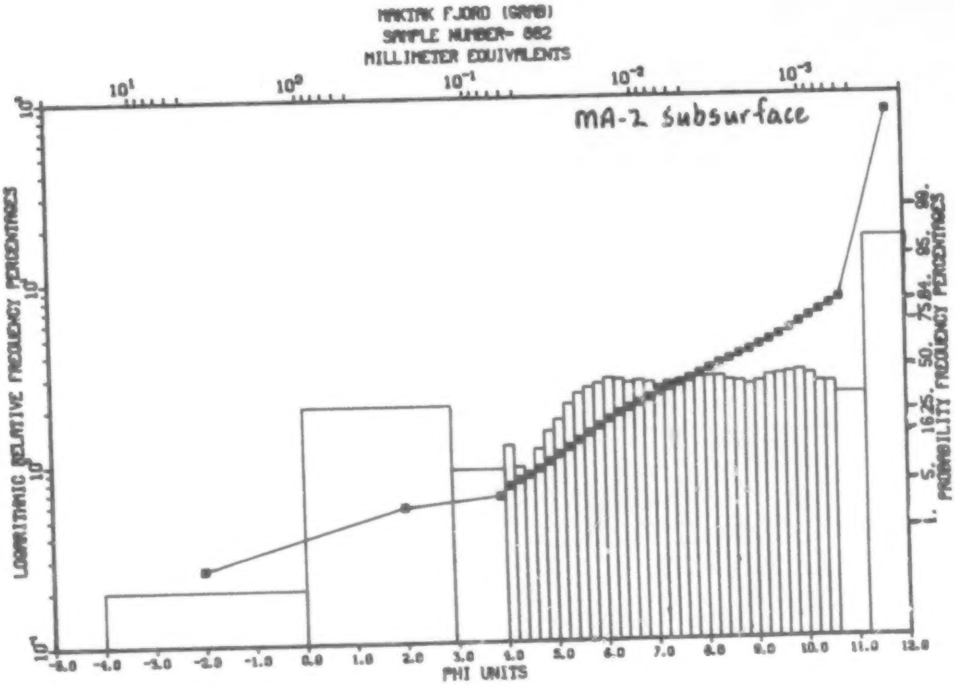
N. PANGNIRTUNG FJORD (GRAB)
SAMPLE NUMBER- 839
MILLIMETER EQUIVALENTS

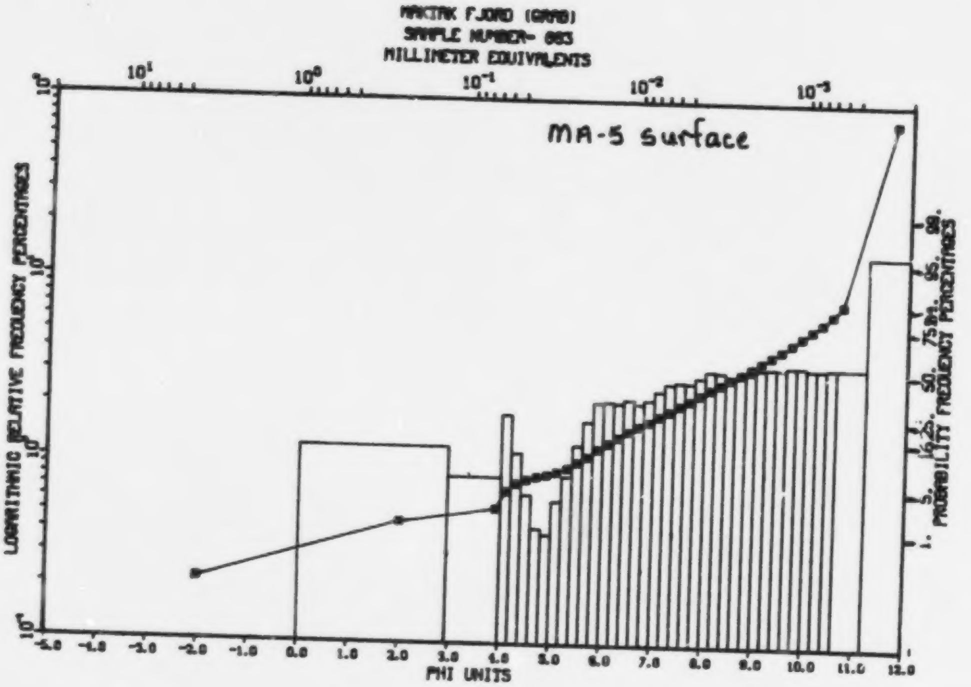


N. PANGNIRTUNG FJORD (GRAB)
SAMPLE NUMBER- 840
MILLIMETER EQUIVALENTS

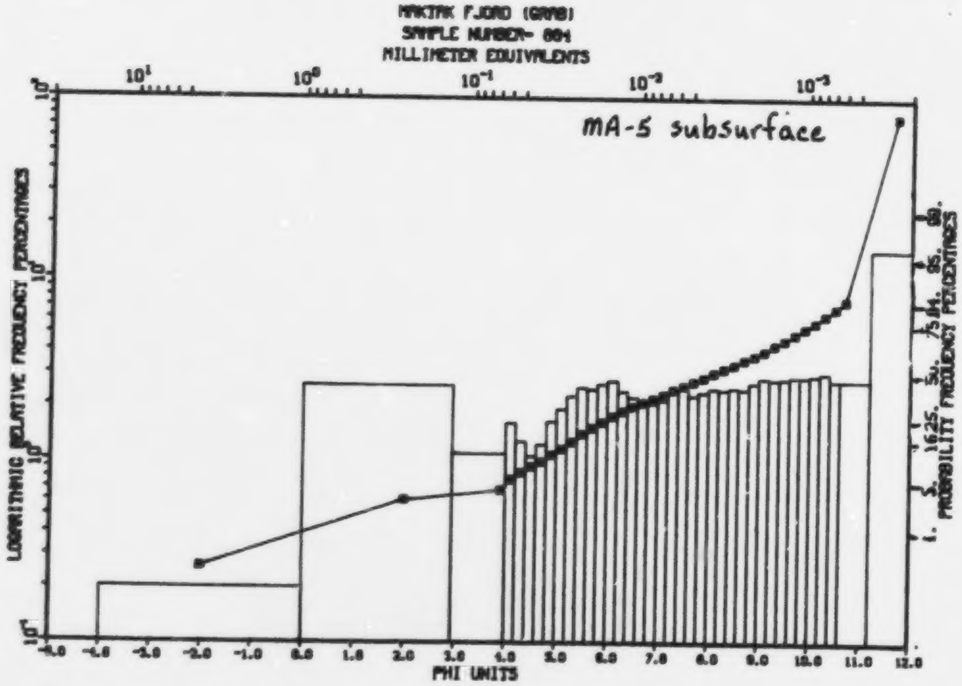



MAKTAK FJORD (GRAB)
SAMPLE NUMBER- 001
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
MA-2 surface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

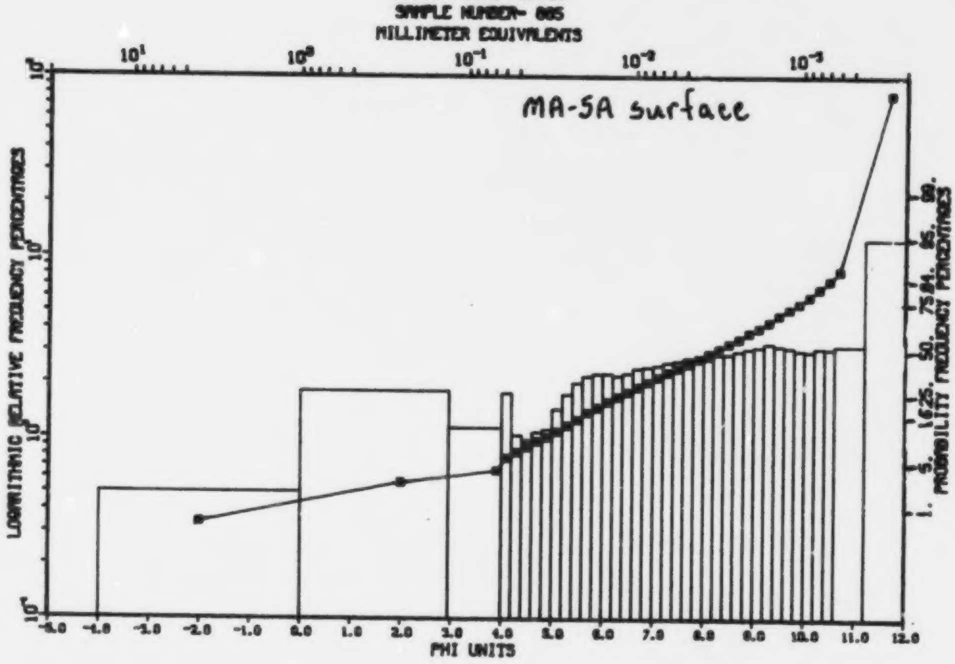

MAKTAK FJORD (GRAB)
SAMPLE NUMBER- 002
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
MA-2 subsurface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

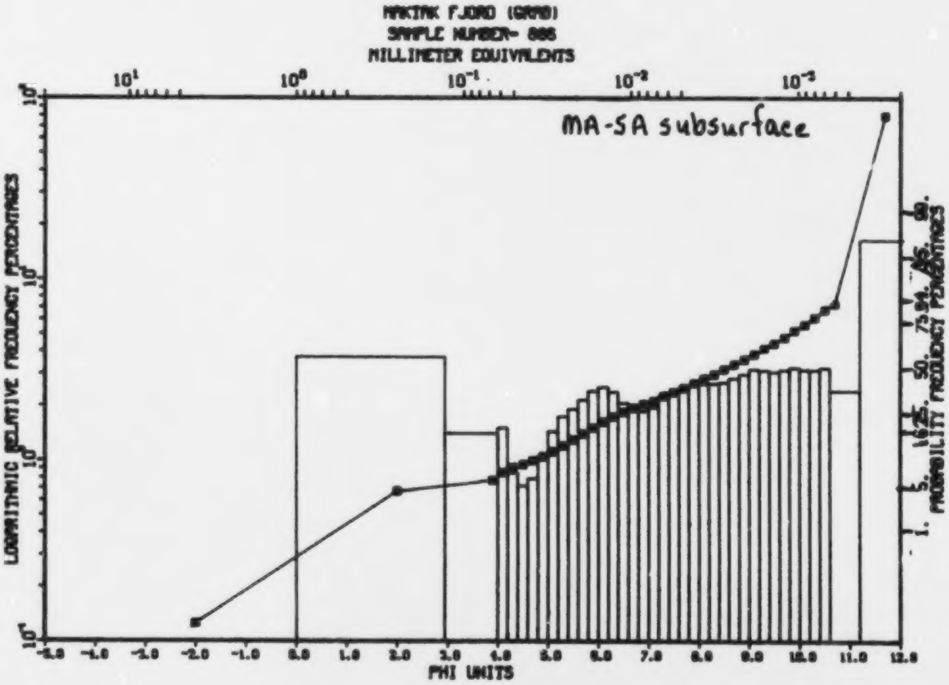


MA-5 surface

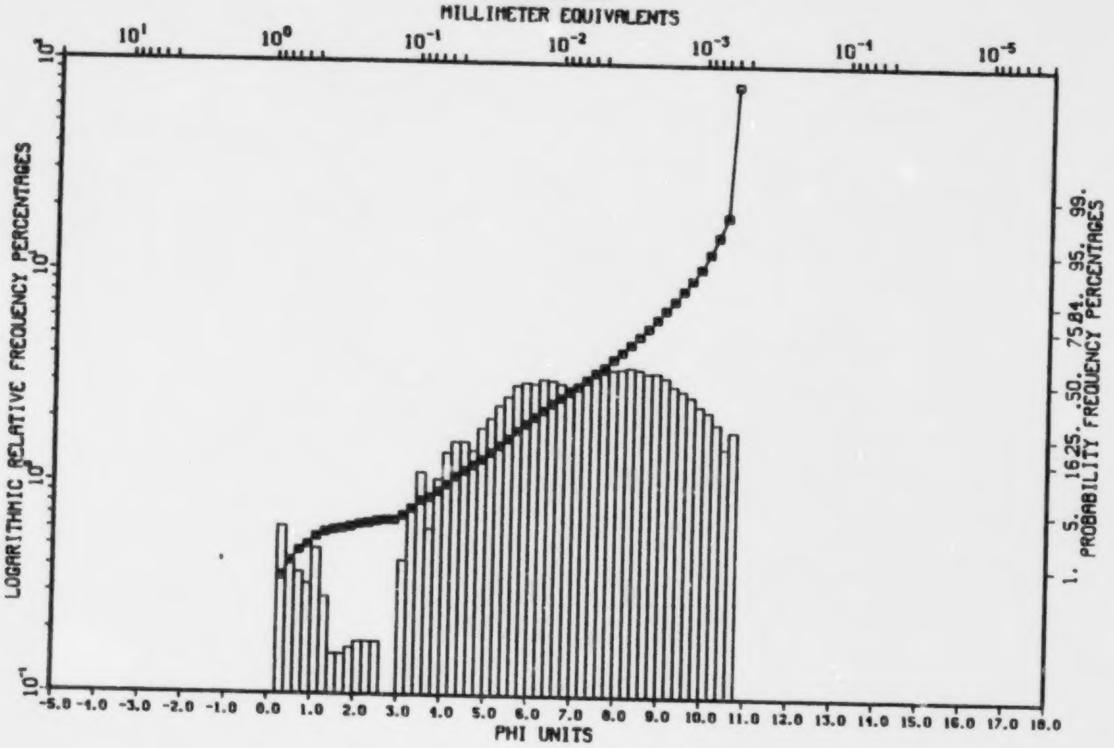


MA-5 subsurface

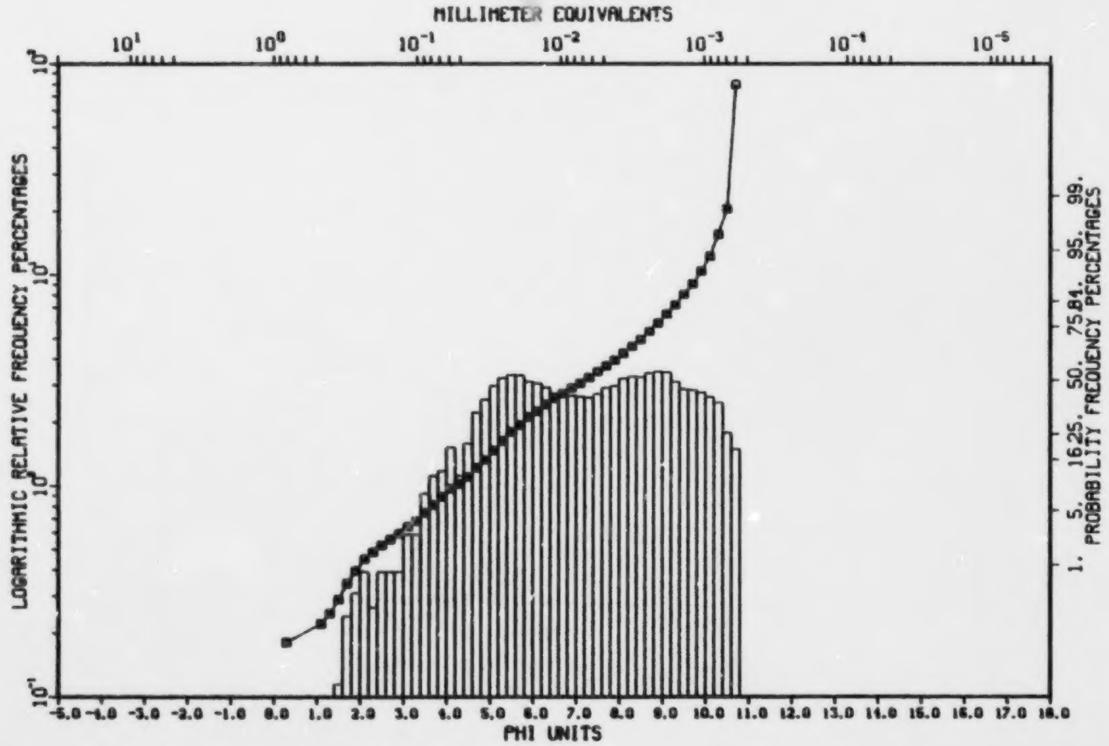

MAKTAK FJORD (GRAB)
SAMPLE NUMBER- 885
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
MA-5A surface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


MAKTAK FJORD (GRAB)
SAMPLE NUMBER- 886
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
MA-5A subsurface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

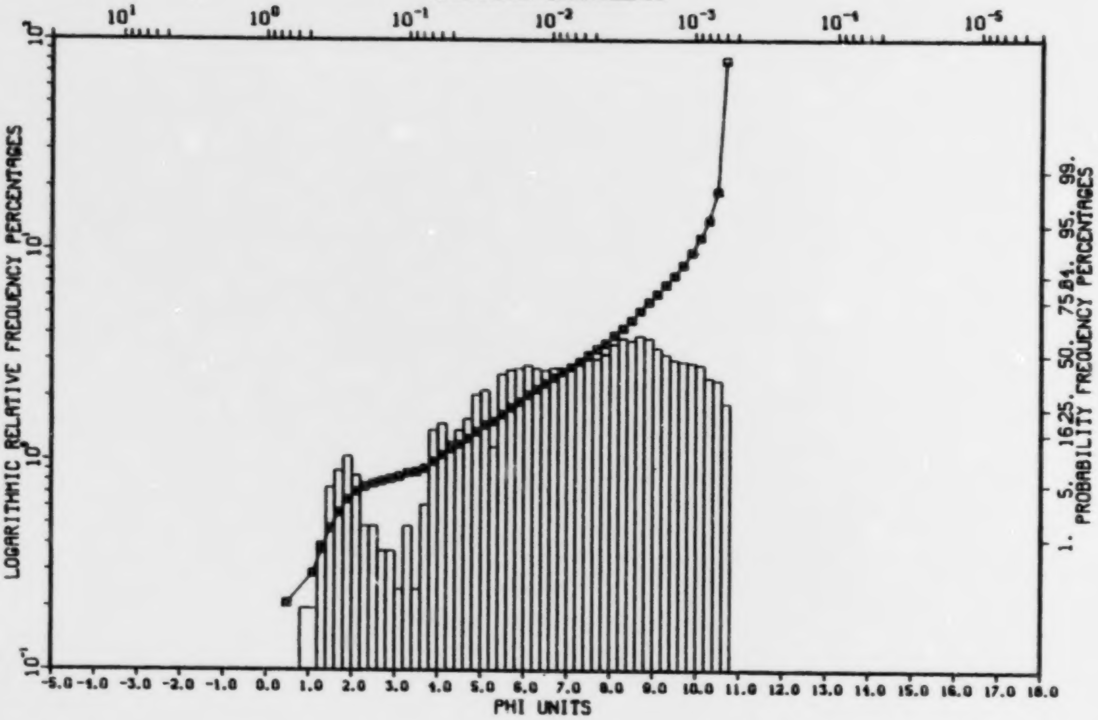
MAKTAK FJORD GRAB SAMPLE MA-6A SURFACE
SAMPLE 887



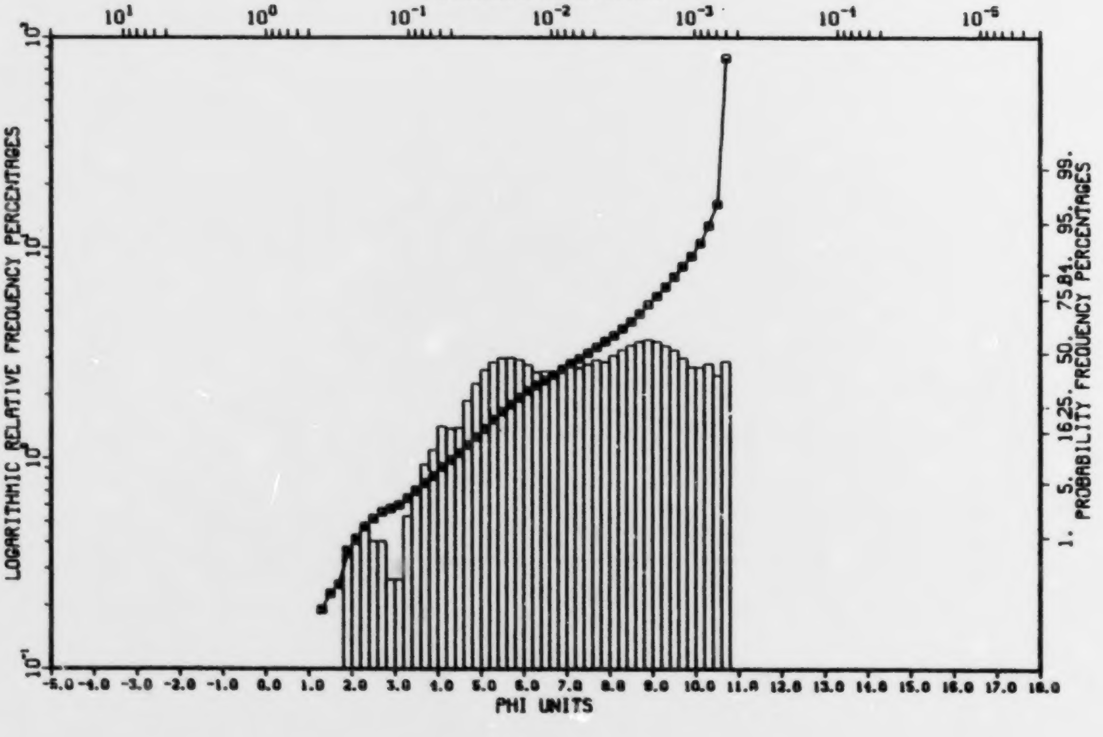
MAKTAK FJORD GRAB SAMPLE MA-6A SUBSURFACE
SAMPLE 888



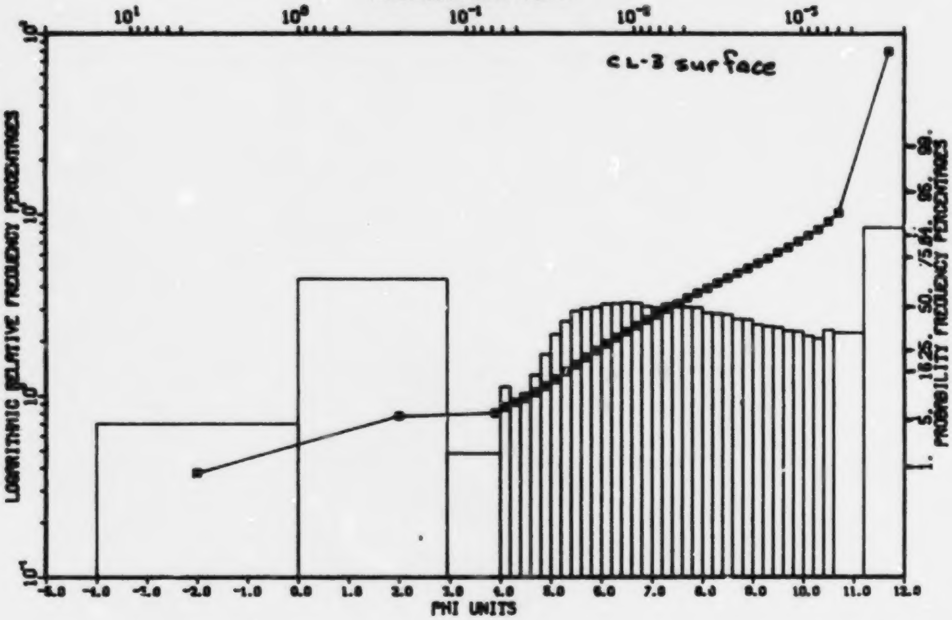
MAKTAK FJORD GRAB SAMPLE MA-7 SURFACE
SAMPLE 889
MILLIMETER EQUIVALENTS



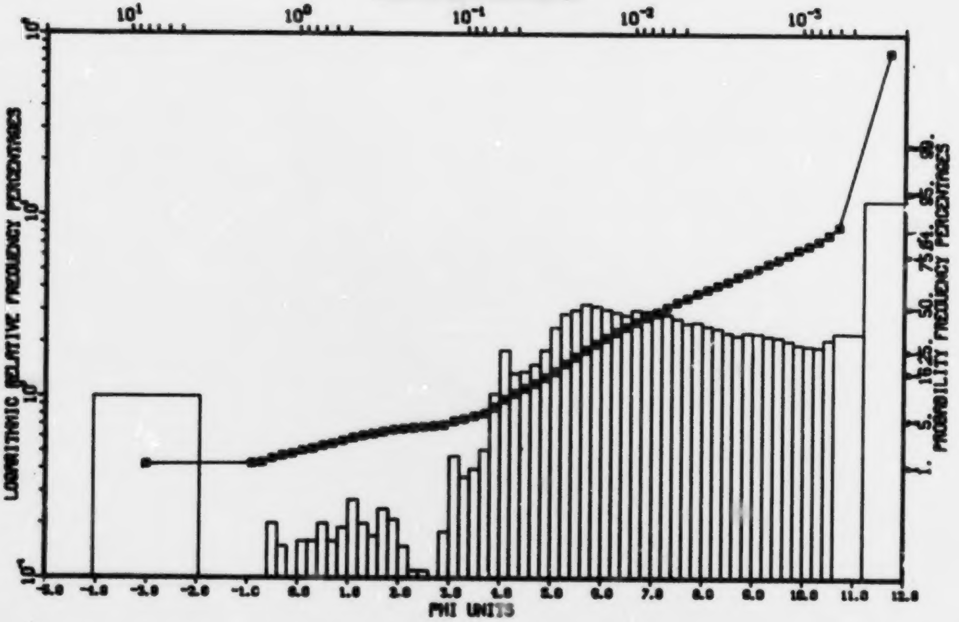
MAKTAK FJORD GRAB SAMPLE MA-7 SUBSURFACE
SAMPLE 890
MILLIMETER EQUIVALENTS



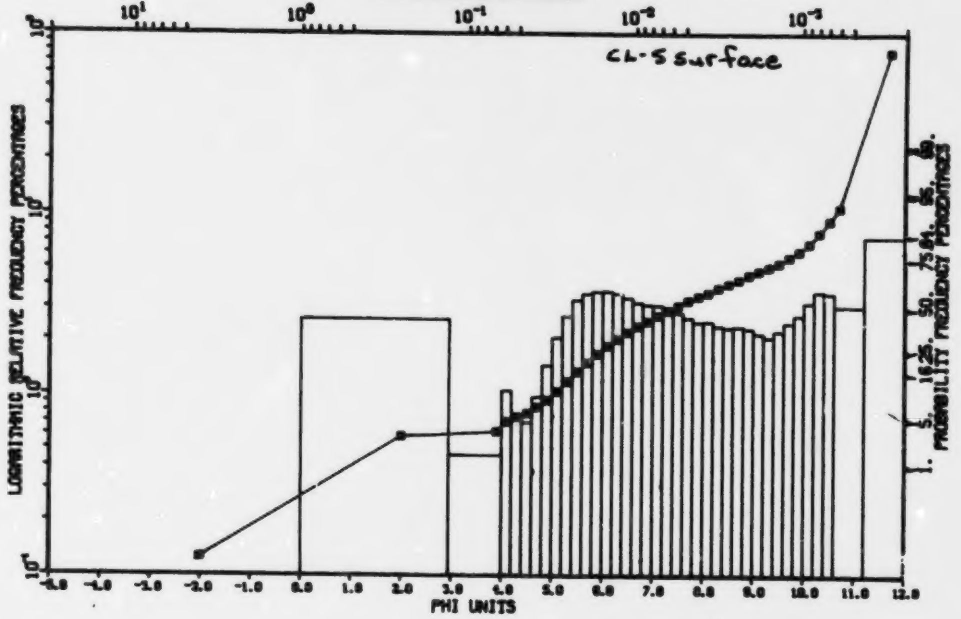
CLARK FJORD (GRAB)
SAMPLE NUMBER- 062



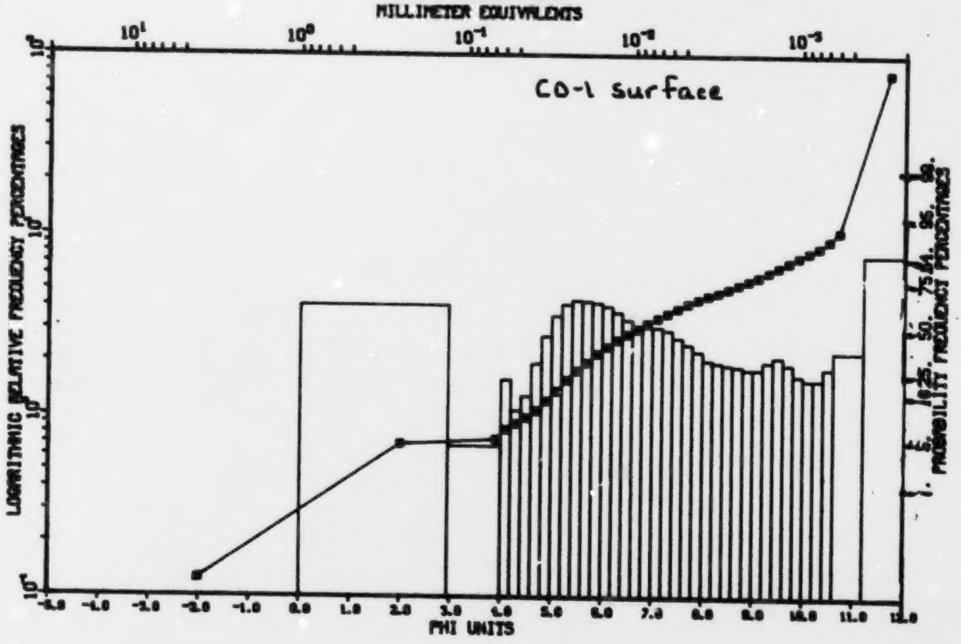
CLARK FJORD (GRAB) CL-3 SUBSURFACE
SAMPLE 063

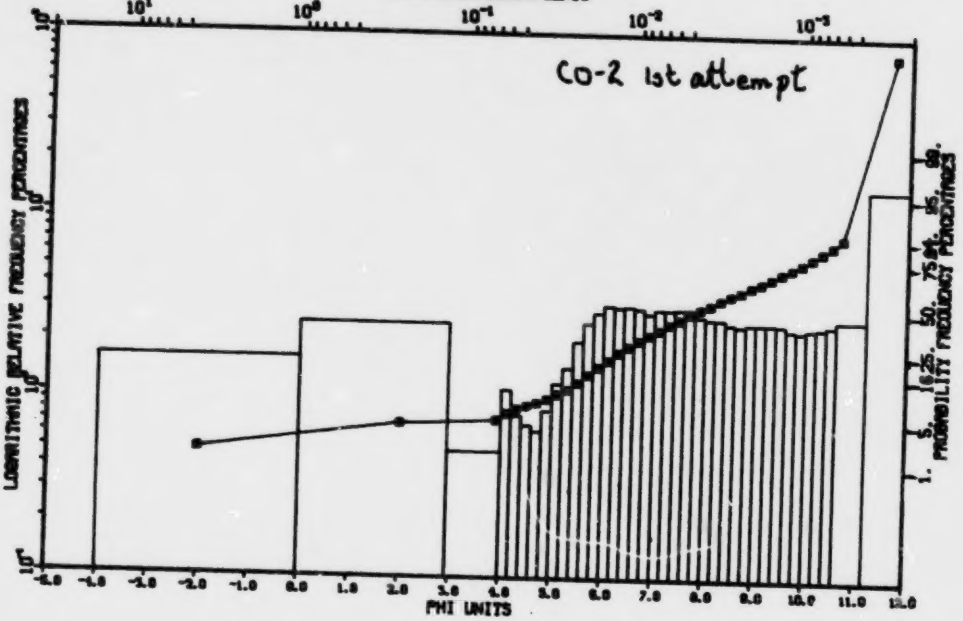


CLARK FJORD (GRAB)
SAMPLE NUMBER- 886

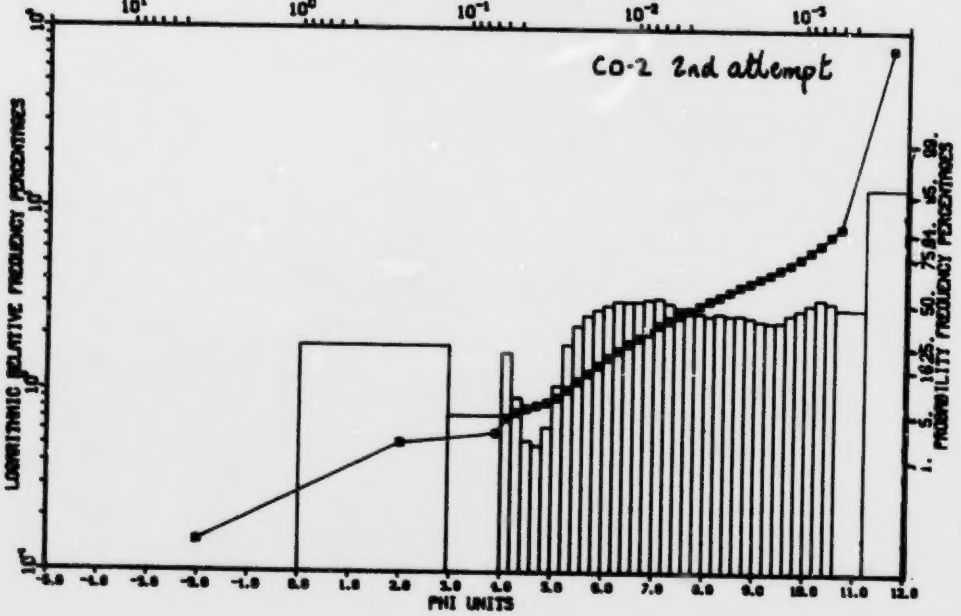


CORONATION FJORD (GRAB)
SAMPLE NUMBER- 874

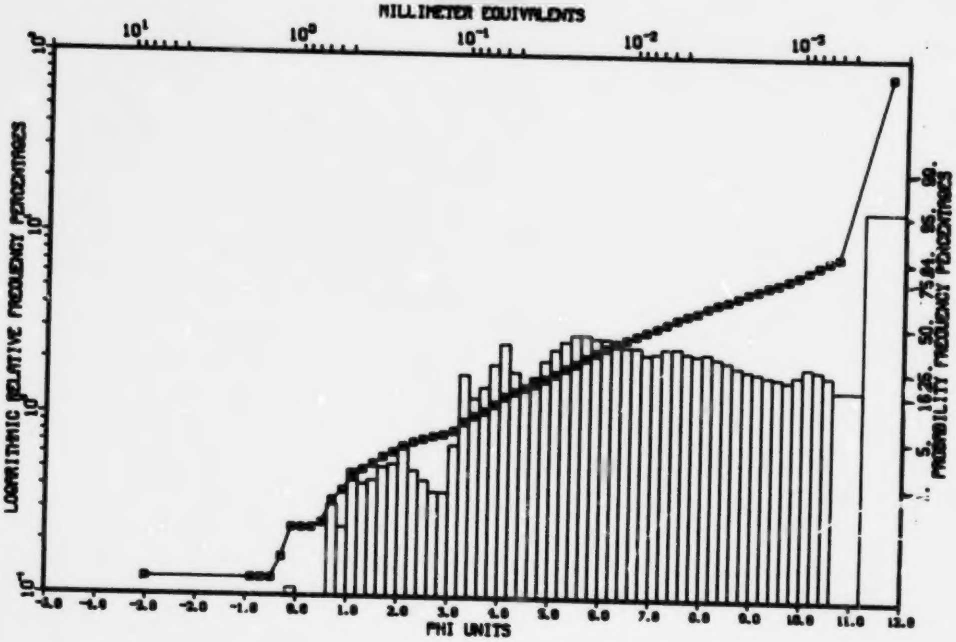


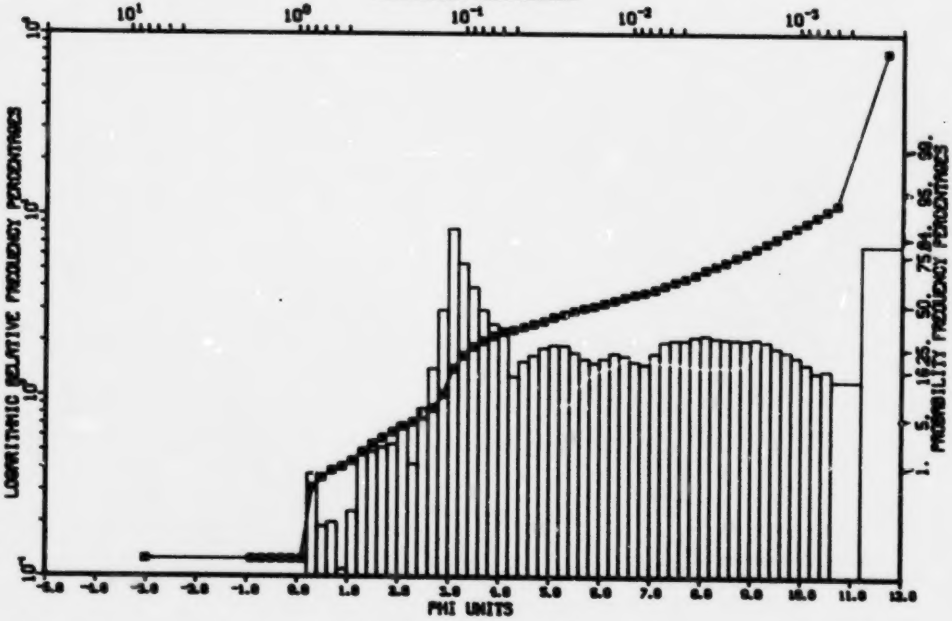


CORONATION FJORD (GRAB)
SAMPLE NUMBER- 076
MILLIMETER EQUIVALENTS

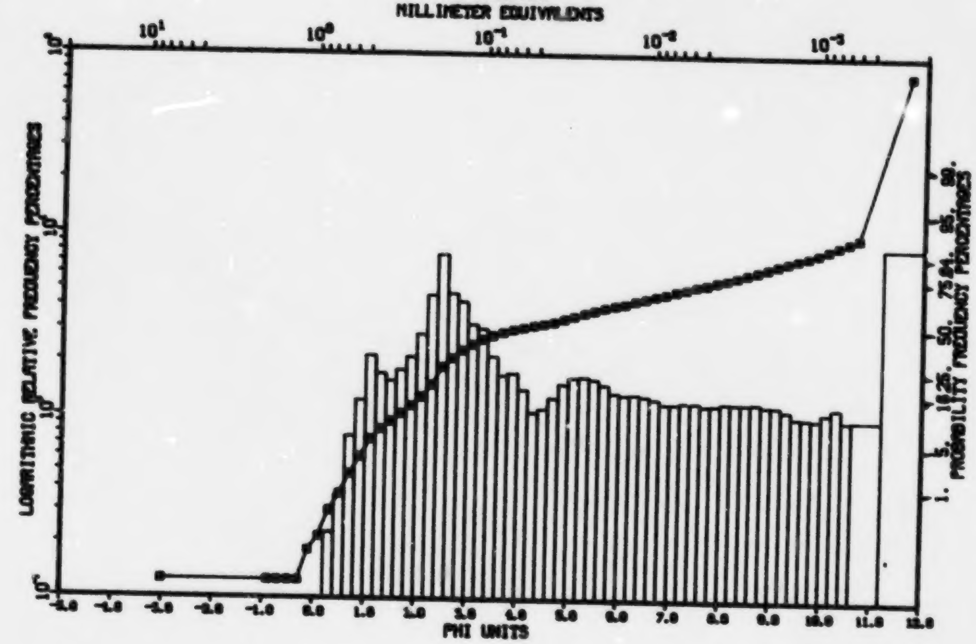


CORONATION FJORD (GRAB)
SAMPLE NUMBER- 077
MILLIMETER EQUIVALENTS

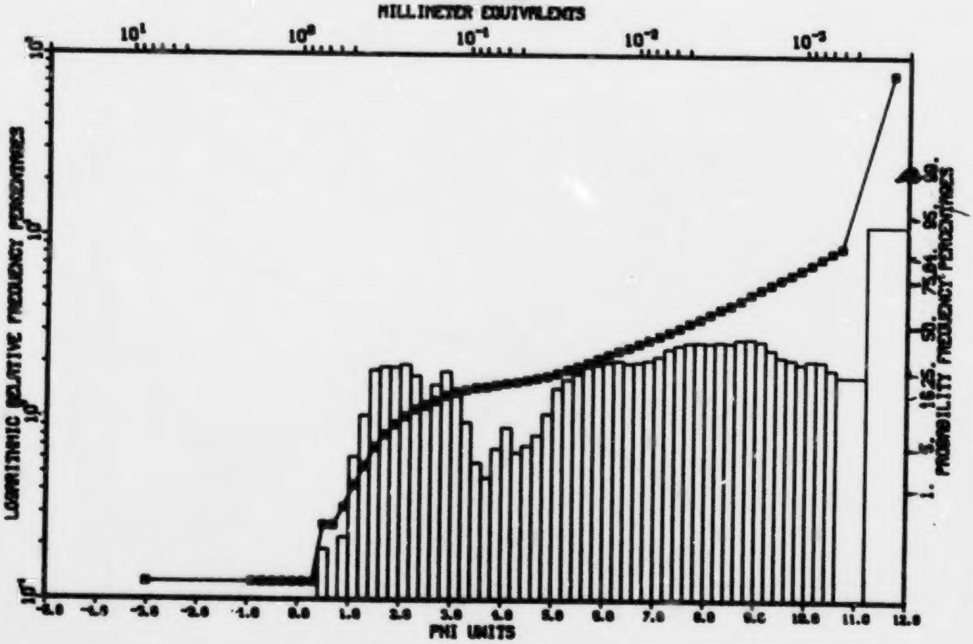

INUGSUIN FJORD (GRAB) IN-1 SURFACE
SAMPLE 898
MILLIMETER EQUIVALENTS


INUGSUIN FJORD (GRAB) IN-2 SURFACE
SAMPLE 900
MILLIMETER EQUIVALENTS

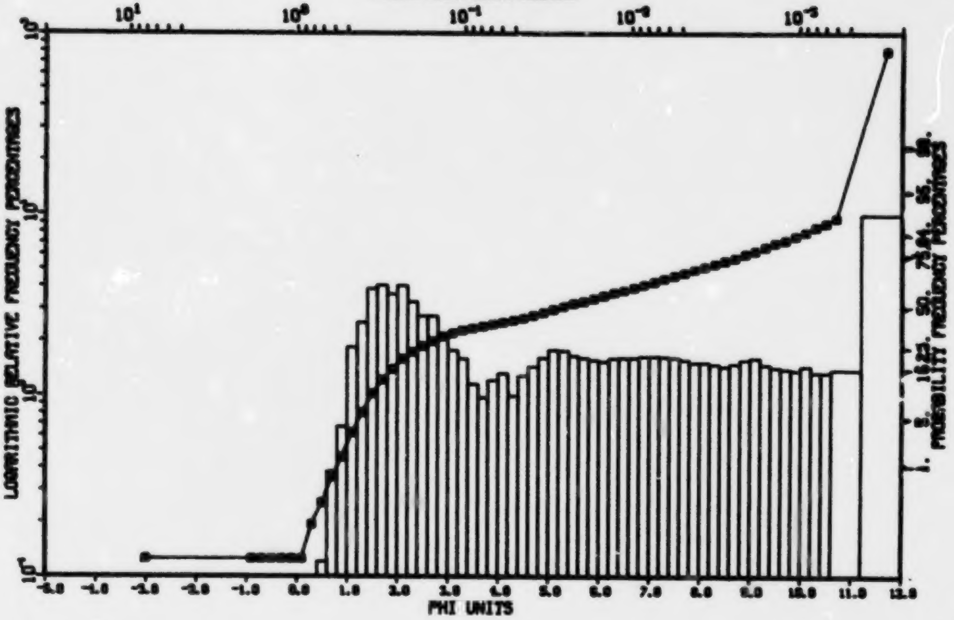
INUSSUIN FJORD (GRAB) IN-2 SUBSURFACE
SAMPLE 801



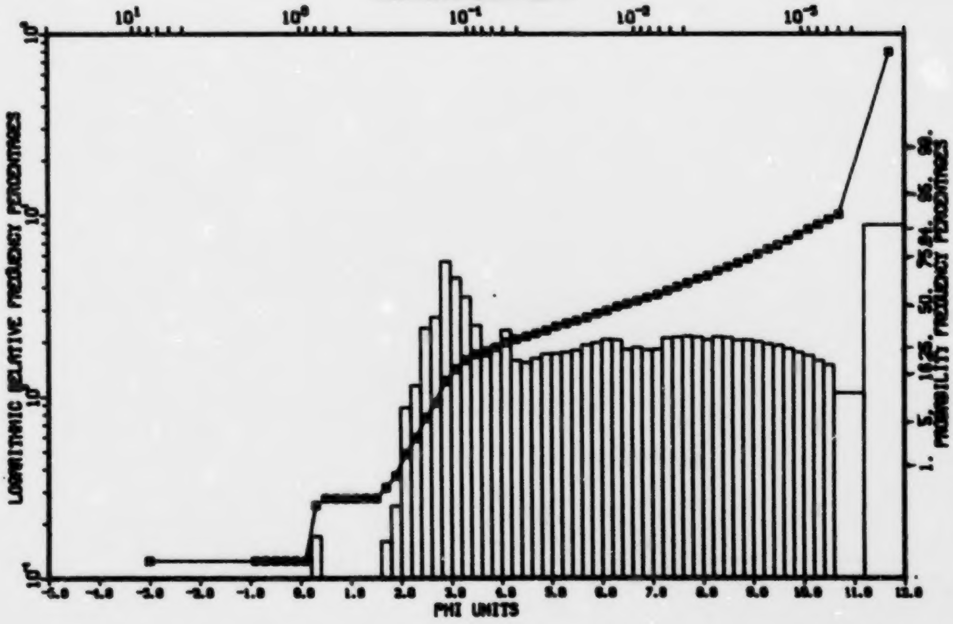
INUSSUIN FJORD (GRAB) IN-3 SURFACE
SAMPLE 802



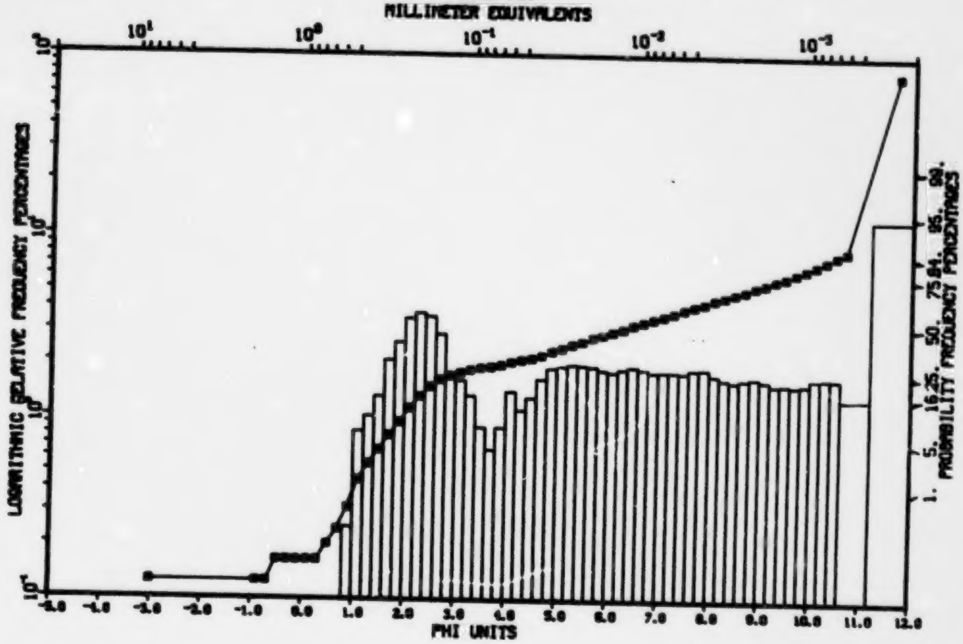
INUGSUIN FJORD (GRAB) IN-3 SUBSURFACE
SAMPLE 803
MILLIMETER EQUIVALENTS



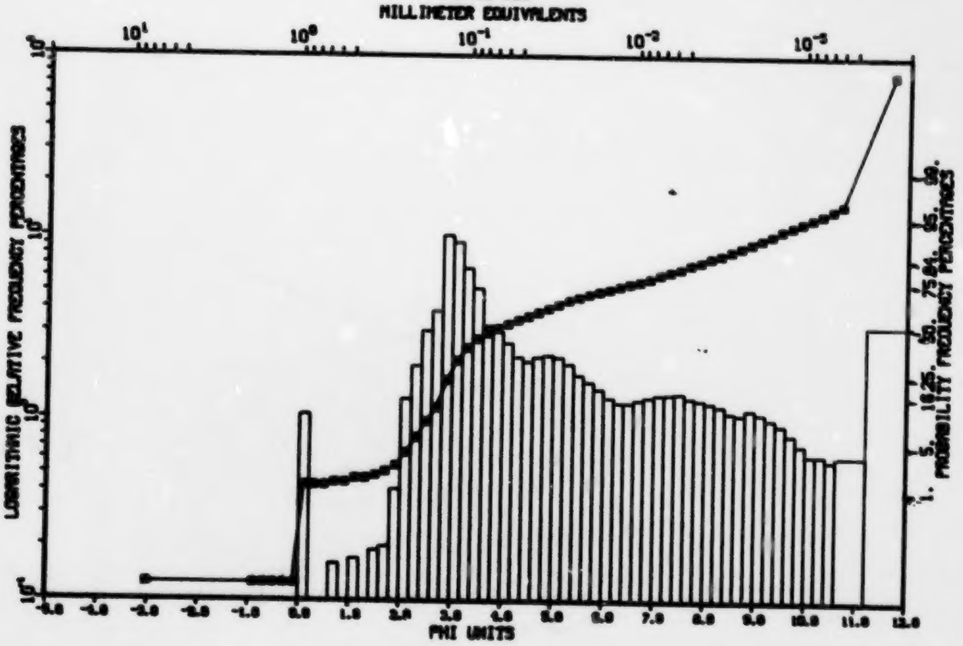
INUGSUIN FJORD (GRAB) IN-4 SURFACE
SAMPLE 804
MILLIMETER EQUIVALENTS



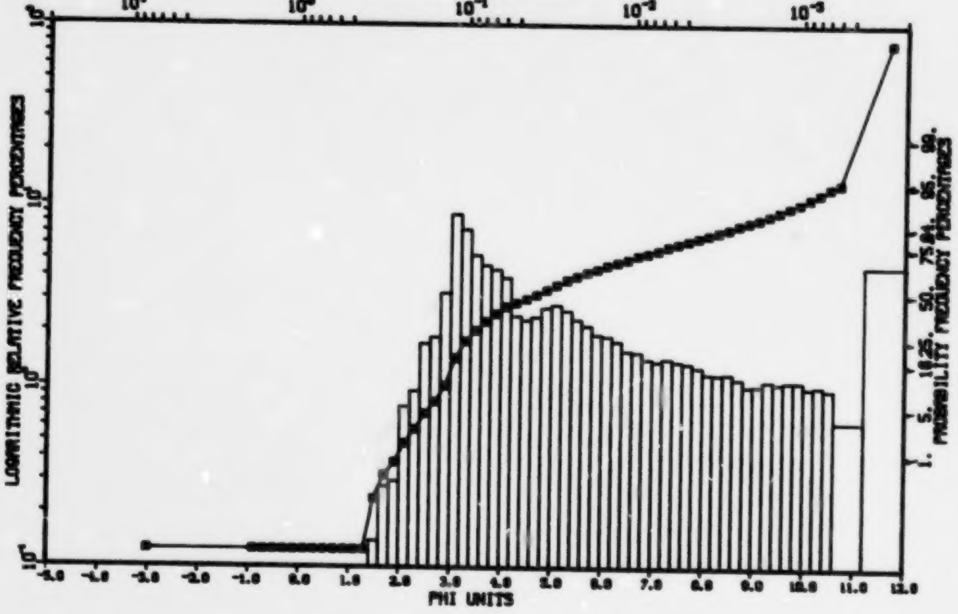
INUSSUIN FJORD (GRAB) IN-4 SUBSURFACE
SAMPLE 905



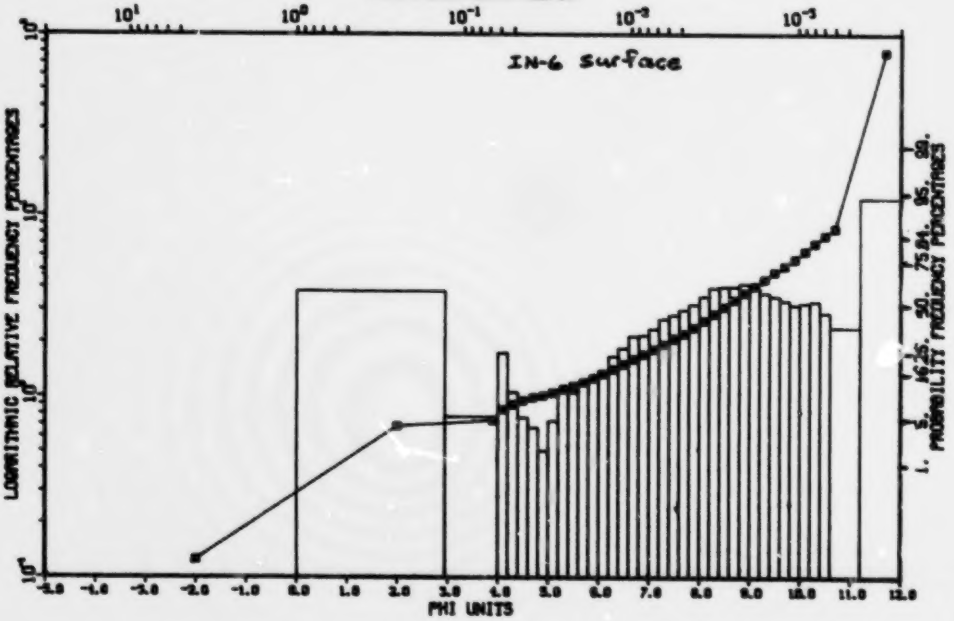
INUSSUIN FJORD (GRAB) IN-5 SURFACE
SAMPLE 908



INUGSUIN FJORD (GRAB) IN-5 SUBSURFACE
SAMPLE 907
MILLIMETER EQUIVALENTS

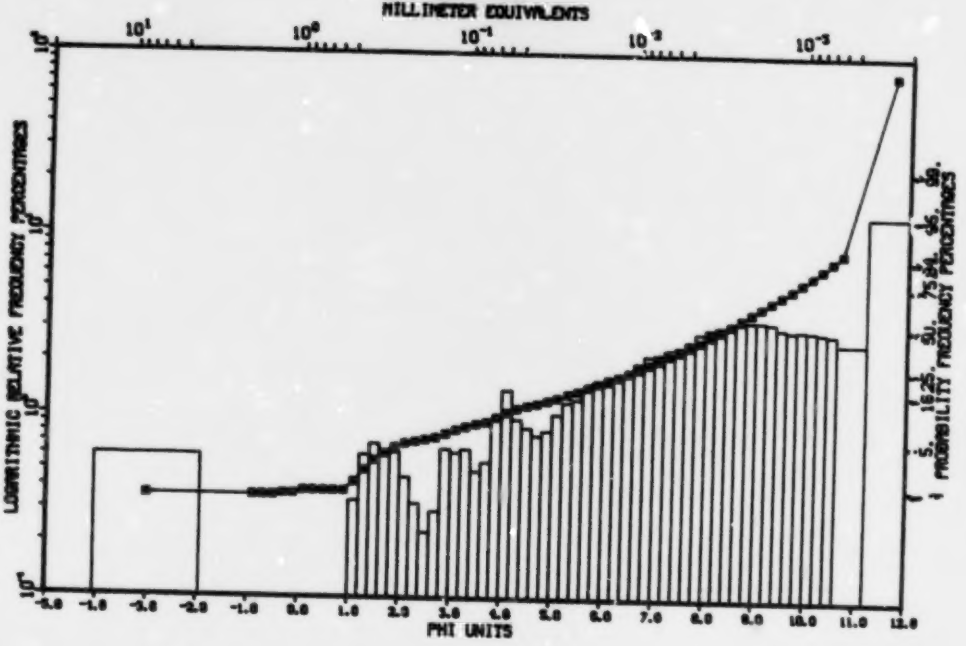


INUGSUIN FJORD (GRAB)
SAMPLE NUMBER- 908
MILLIMETER EQUIVALENTS

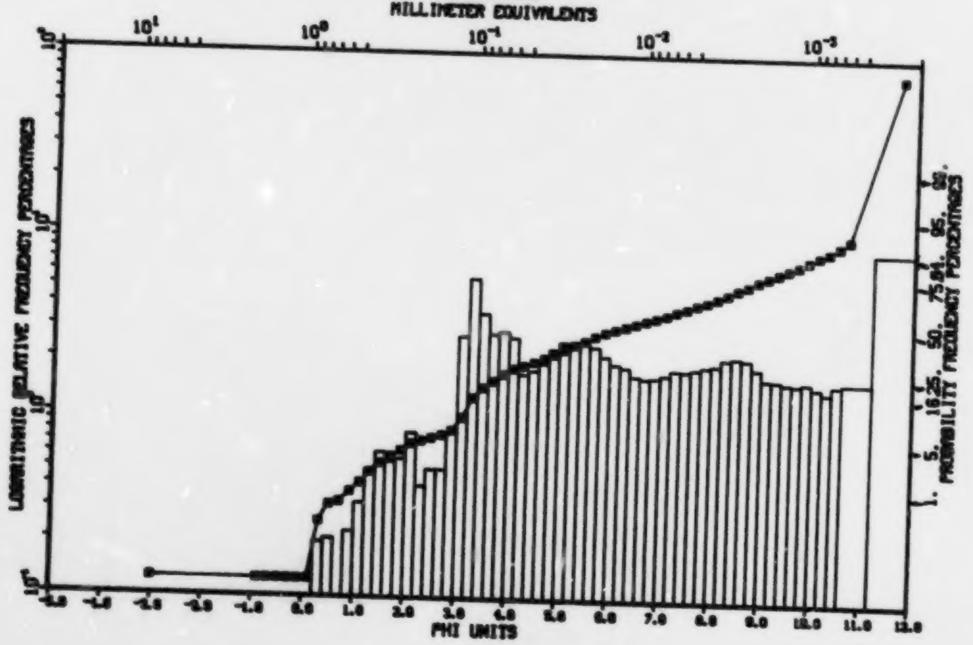


IN-6 surface

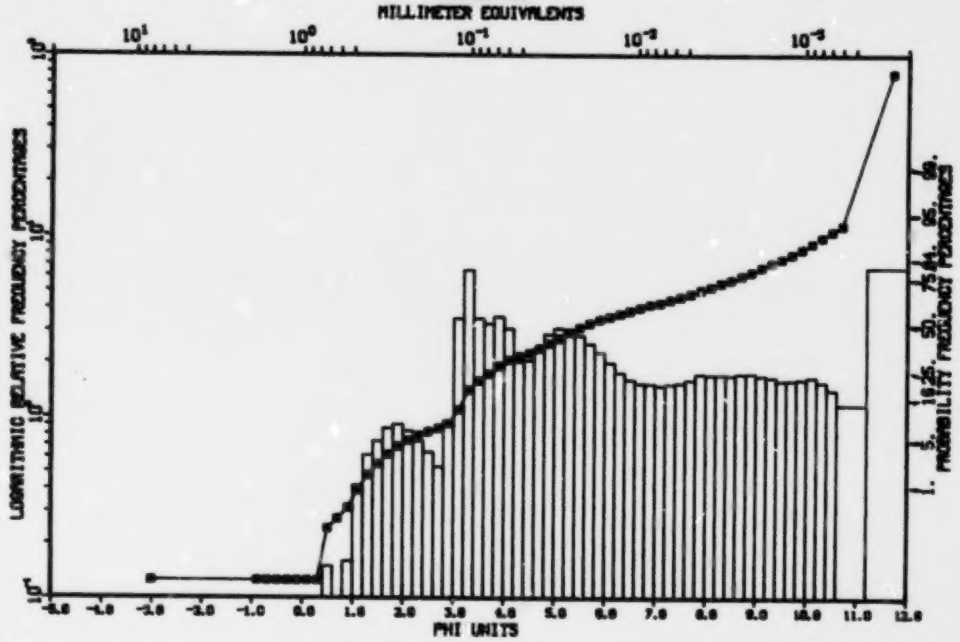
INUGSUIN FJORD (GRAB) IN-6 SUBSURFACE
SAMPLE 909



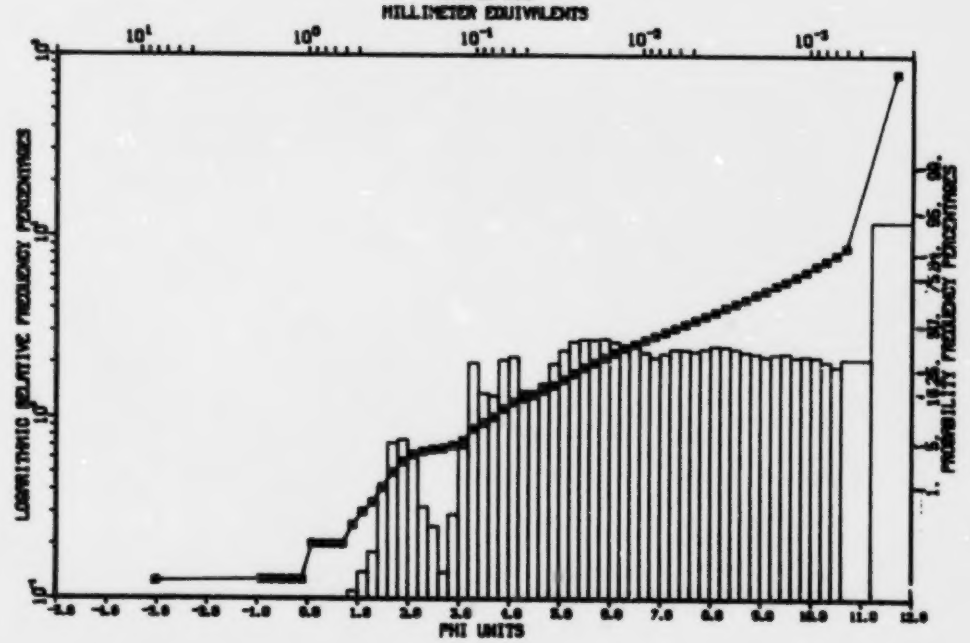
INUGSUIN FJORD (GRAB) IN-7 SURFACE
SAMPLE 910



INUGSUIN FJORD (GRAB) IN-7 SUBSURFACE
SAMPLE 911

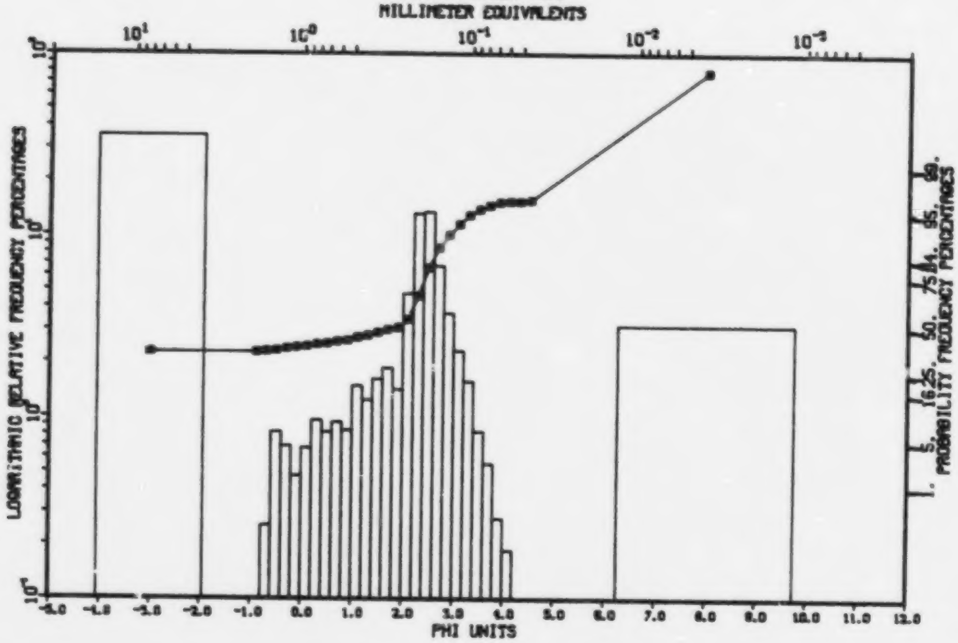


INUGSUIN FJORD (GRAB) IN-8 SUBSURFACE
SAMPLE 912

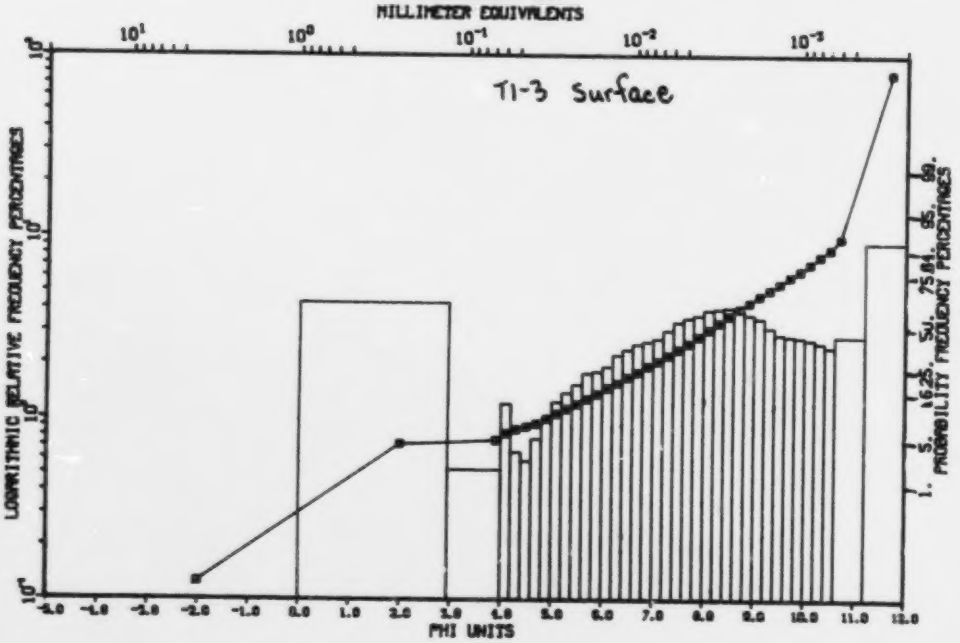


SU-8

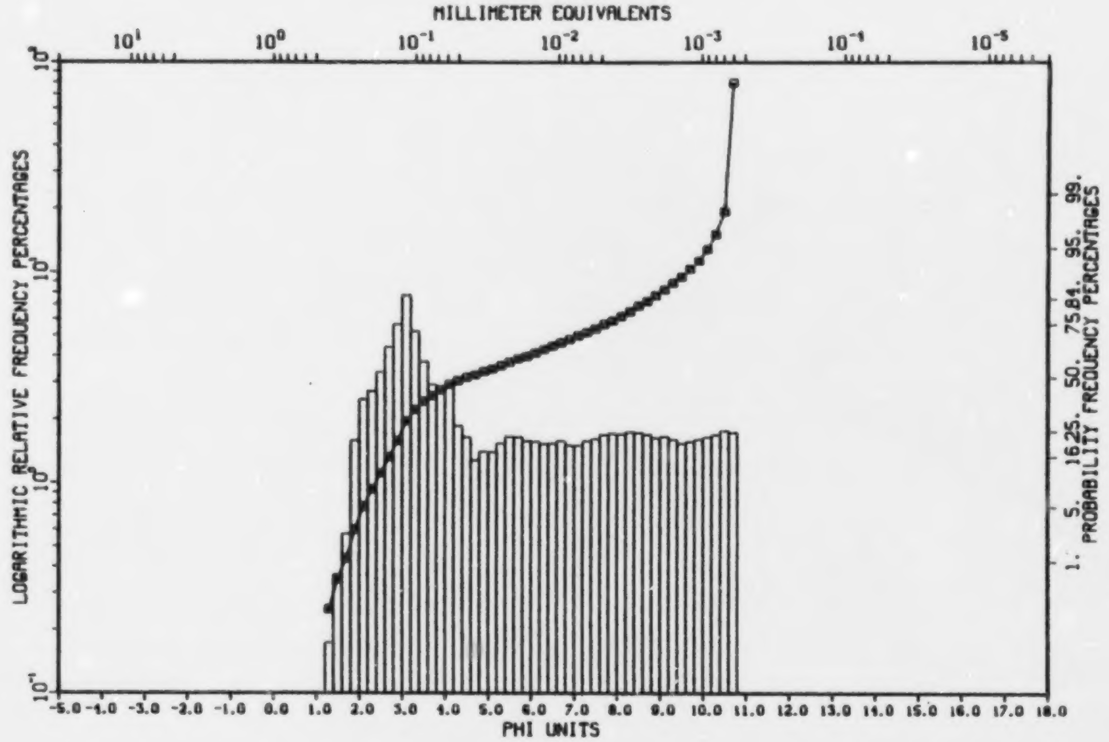
MICRON MUD (NO SEDIGRAPH)
SAMPLE NUMBER- 834



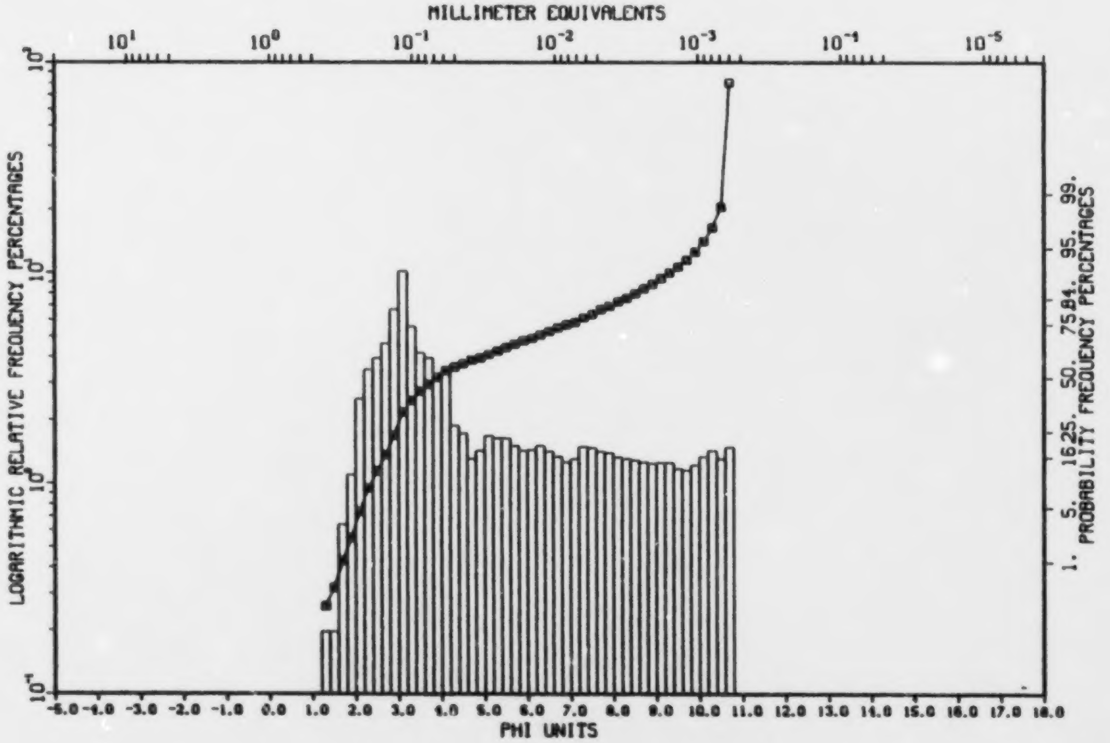
TINGIN FJORD (GRAB)
SAMPLE NUMBER- 895



T1-3 Surface

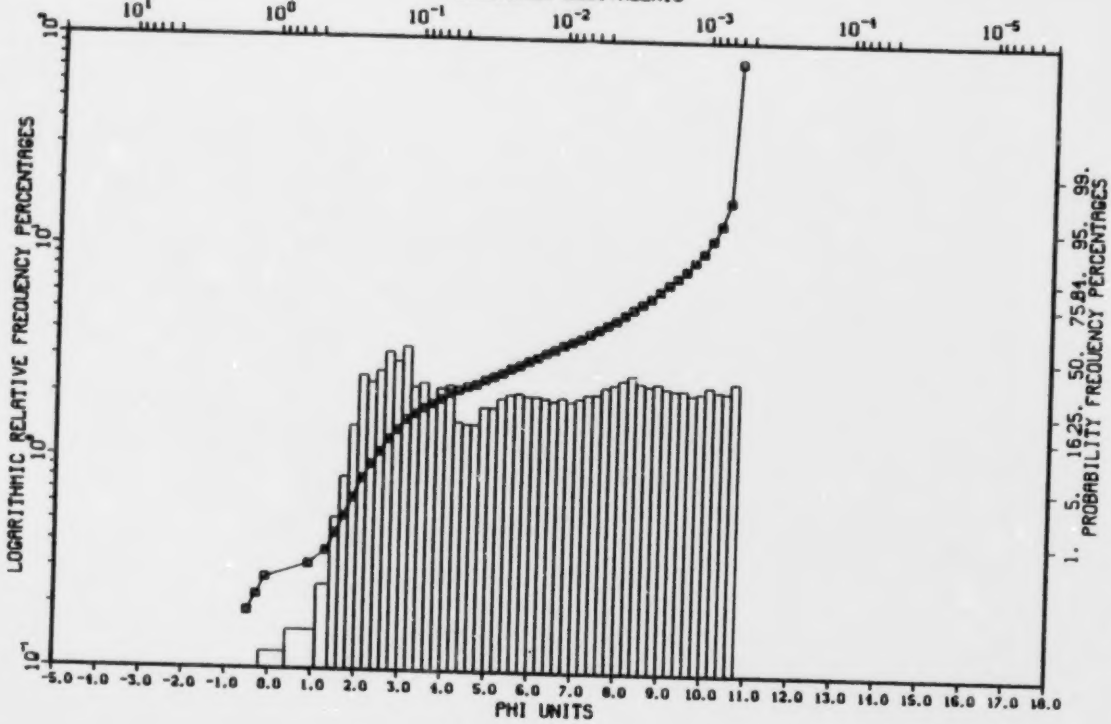


TINGIN FJORD GRAB SAMPLE TI-1A SURFACE
SAMPLE 891

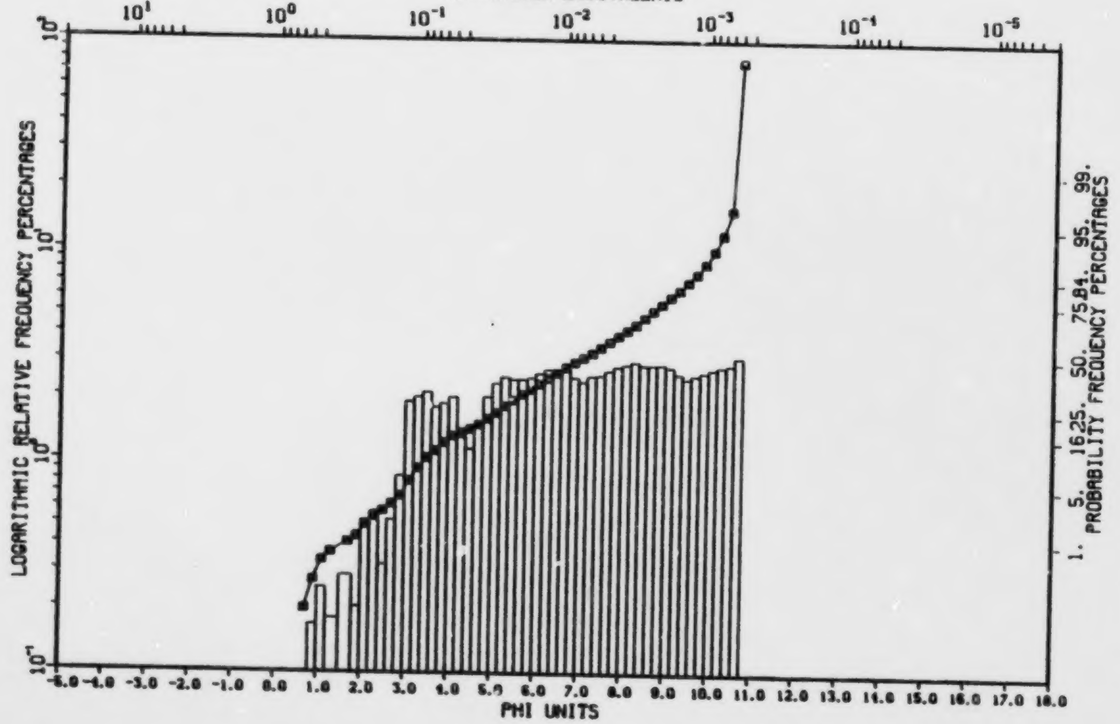


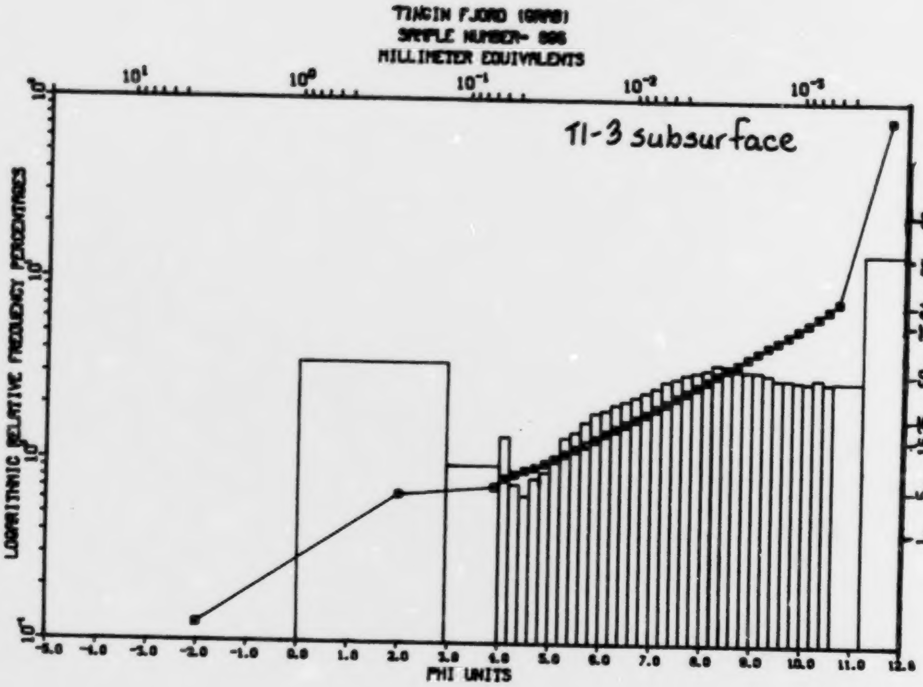
TINGIN FJORD GRAB SAMPLE TI-1A SUBSURFACE
SAMPLE 892

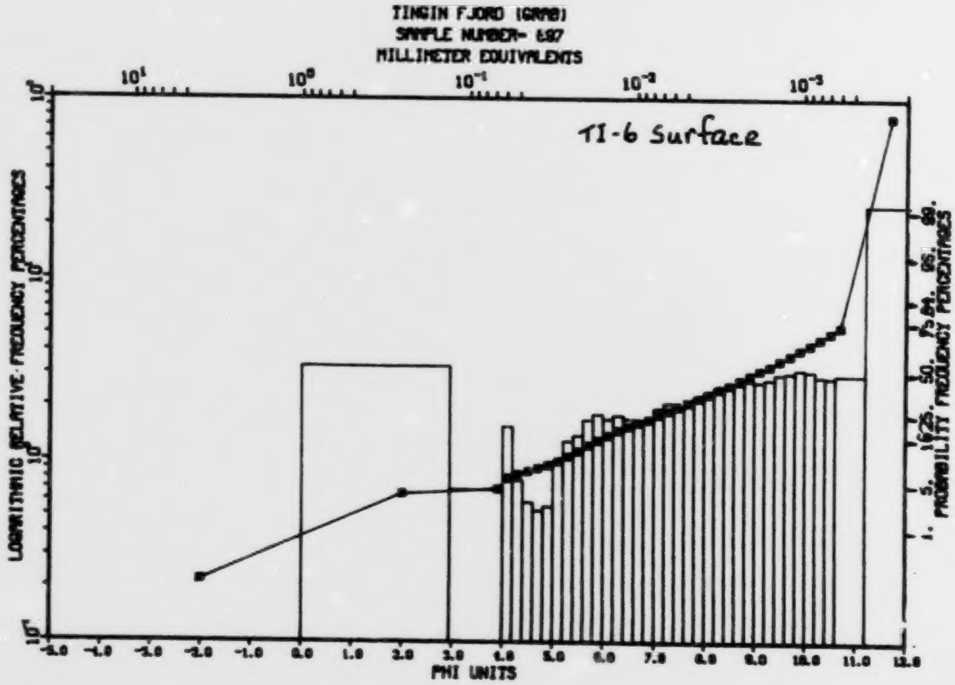
TINGIN FJORD GRAB SAMPLE TI-2 SURFACE
SAMPLE 893

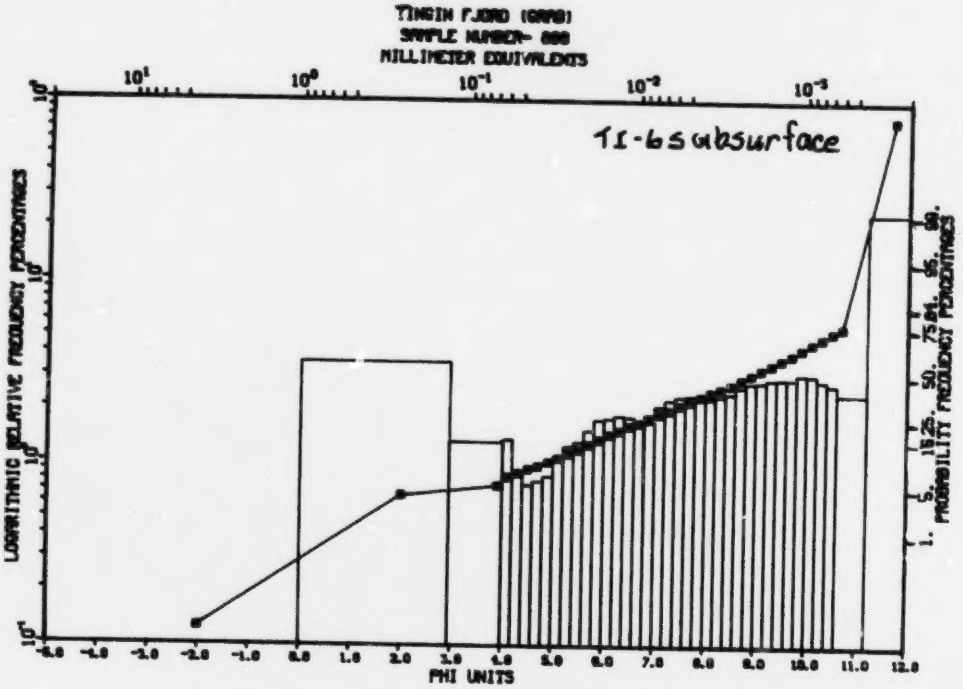


TINGIN FJORD GRAB SAMPLE TI-2 SUBSURFACE
SAMPLE 894




TINGIN FJORD (GRAB)
SAMPLE NUMBER- 686
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
TI-3 subsurface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10²
10¹
10⁰
10⁻¹
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

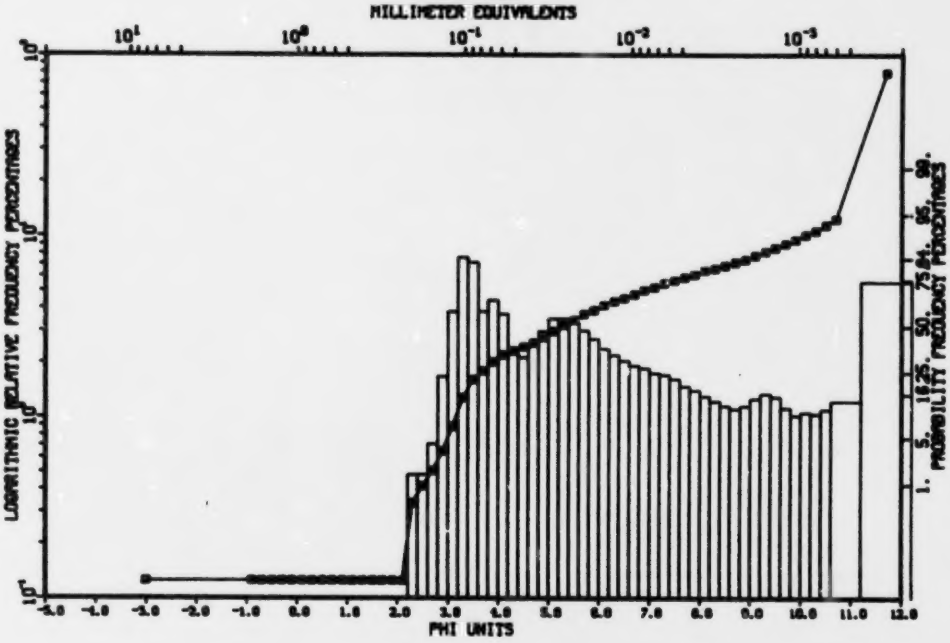

TINGIN FJORD (GRAB)
SAMPLE NUMBER- 687
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
TI-6 Surface
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10²
10¹
10⁰
10⁻¹
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS



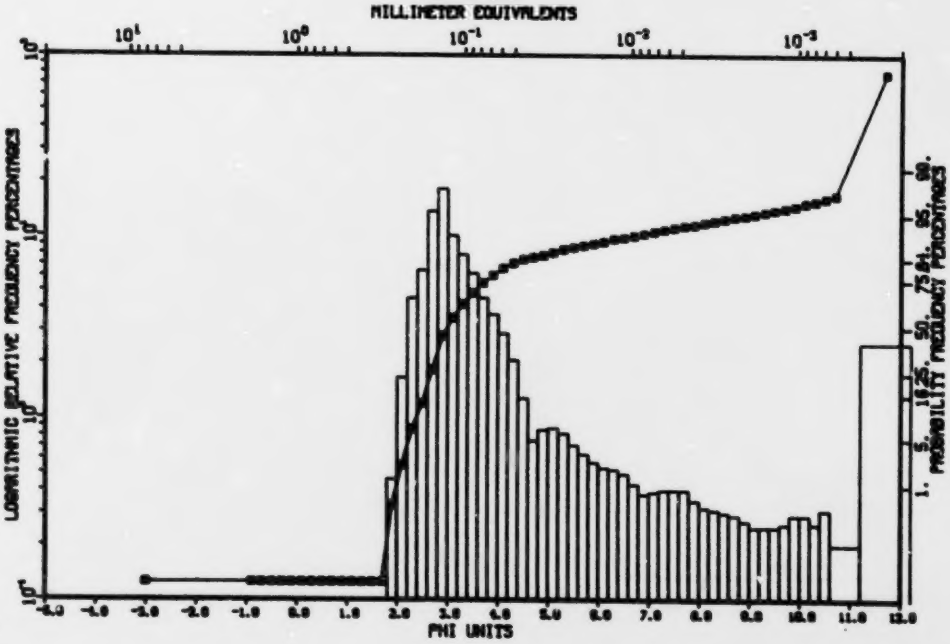
TINGIN FJORD (GRAB)
SAMPLE NUMBER- 000
MILLIMETER EQUIVALENTS

TI-6 subsurface

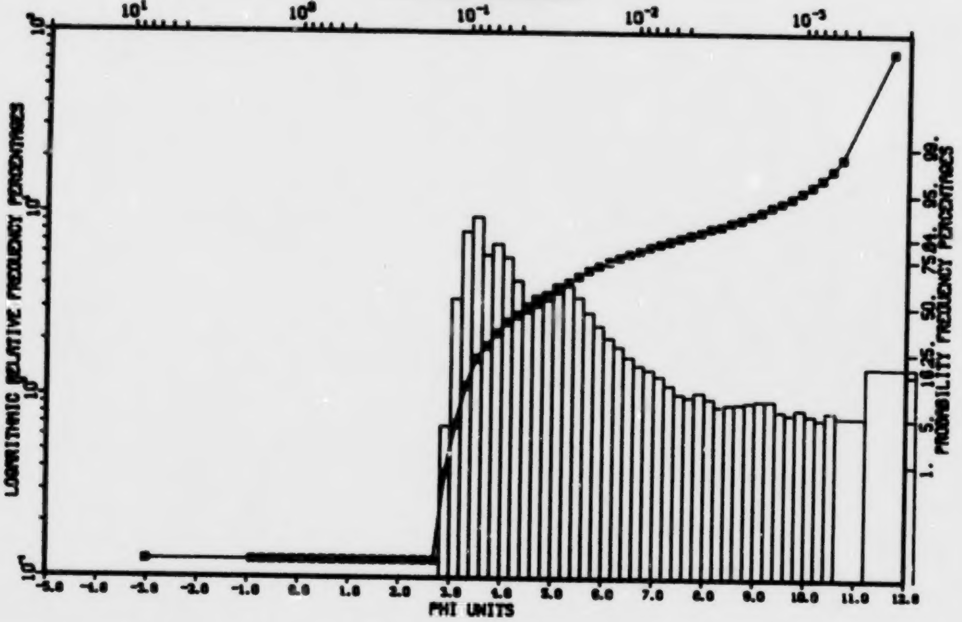
ITO.1 SURFACE HUDSON GRAB
SAMPLE 1986



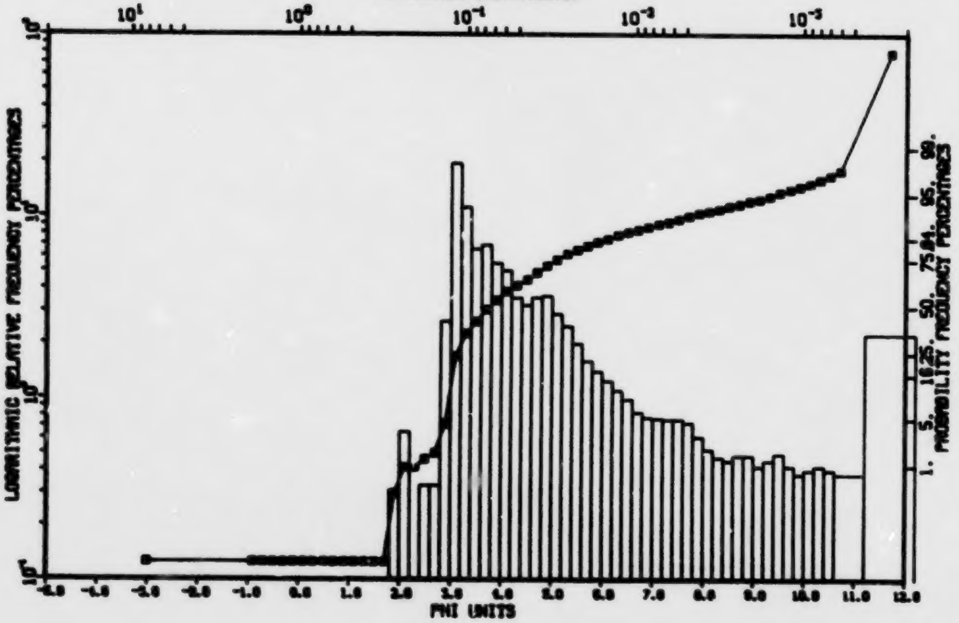
ITO.1 SUBSURFACE HUDSON GRAB
SAMPLE 1987



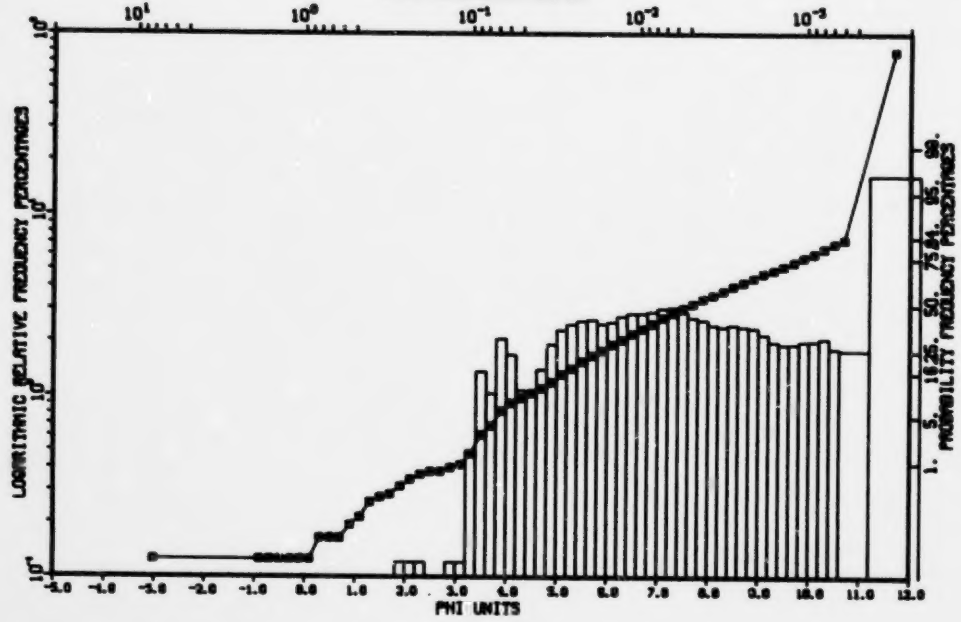
ITO.2 SURFACE HUDSON GRAB
SAMPLE 1980
MILLIMETER EQUIVALENTS



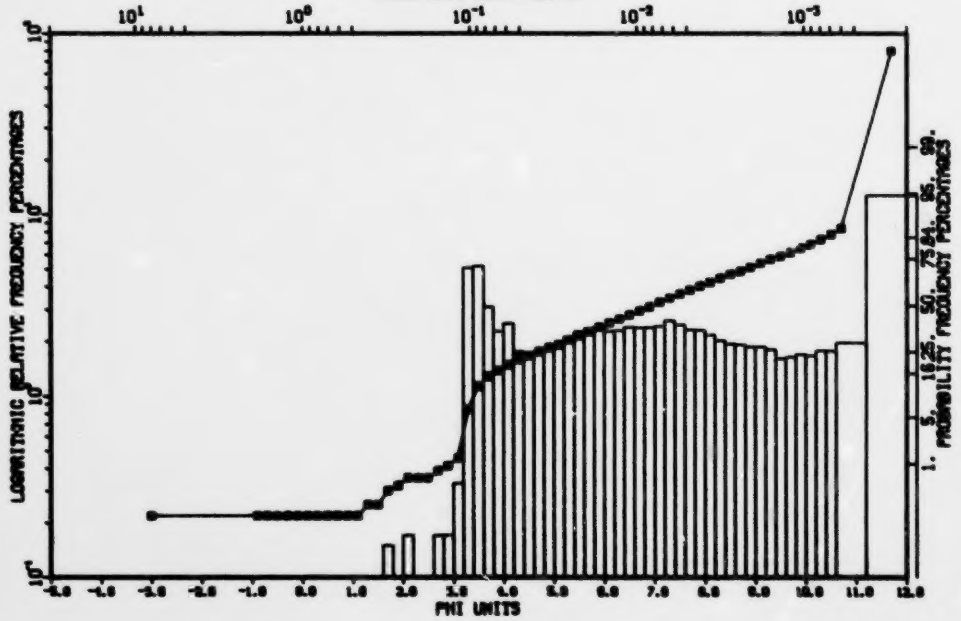
ITO.2 SUBSURFACE HUDSON GRAB
SAMPLE 1980
MILLIMETER EQUIVALENTS



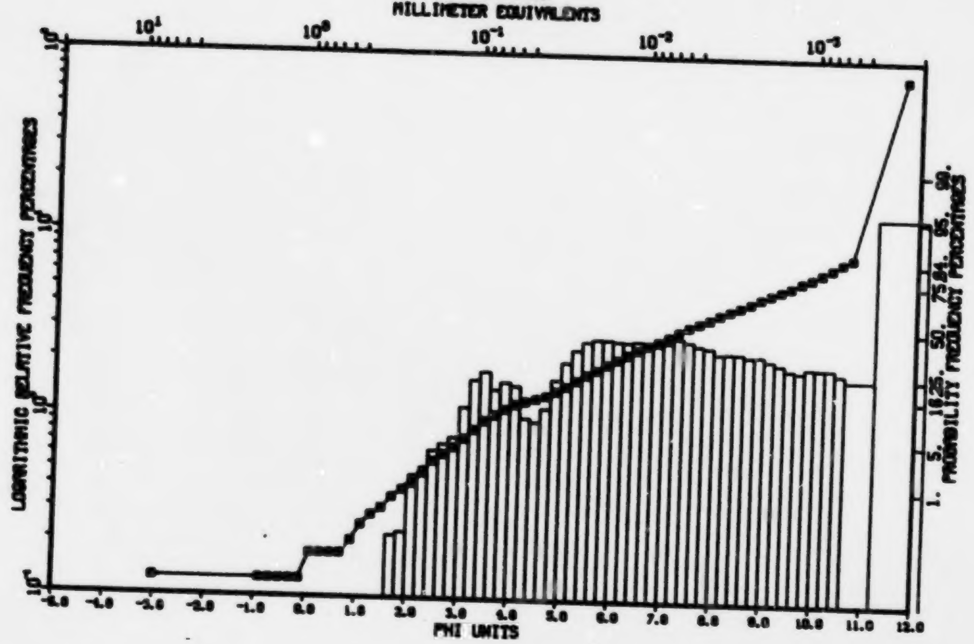
ITO.3 SURFACE HUDSON GRAB
SAMPLE 1990



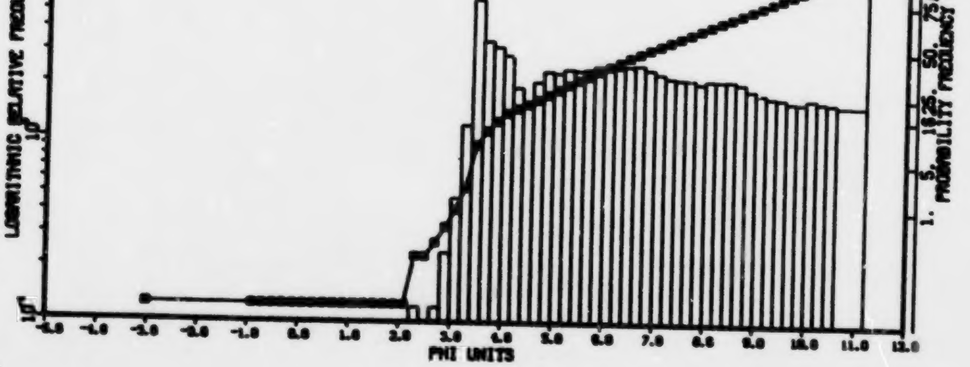
ITO.3 SUBSURFACE HUDSON GRAB
SAMPLE 1991



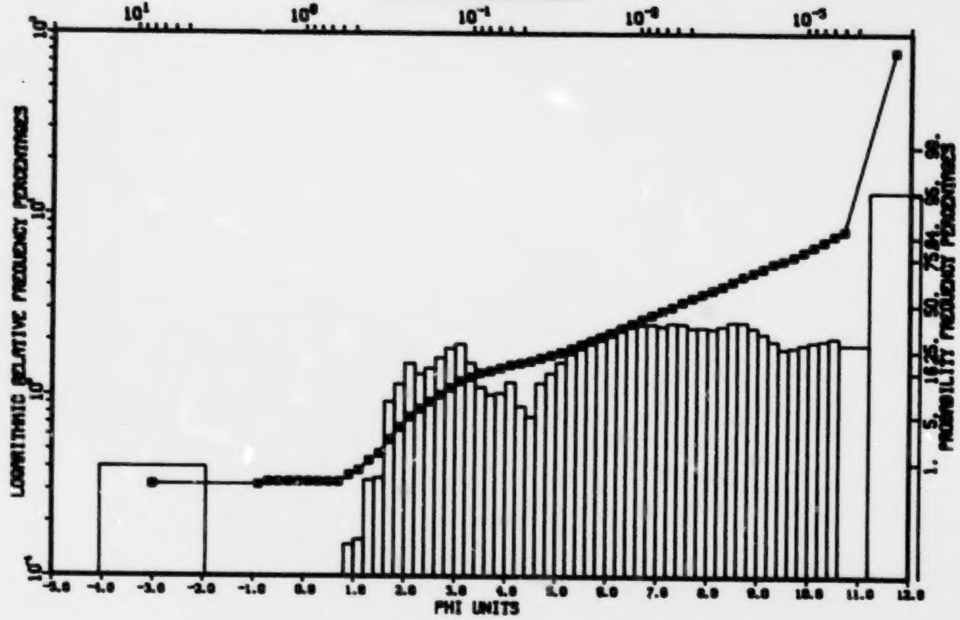
ITD.4 SURFACE HUDSON GRAB
SAMPLE 1982



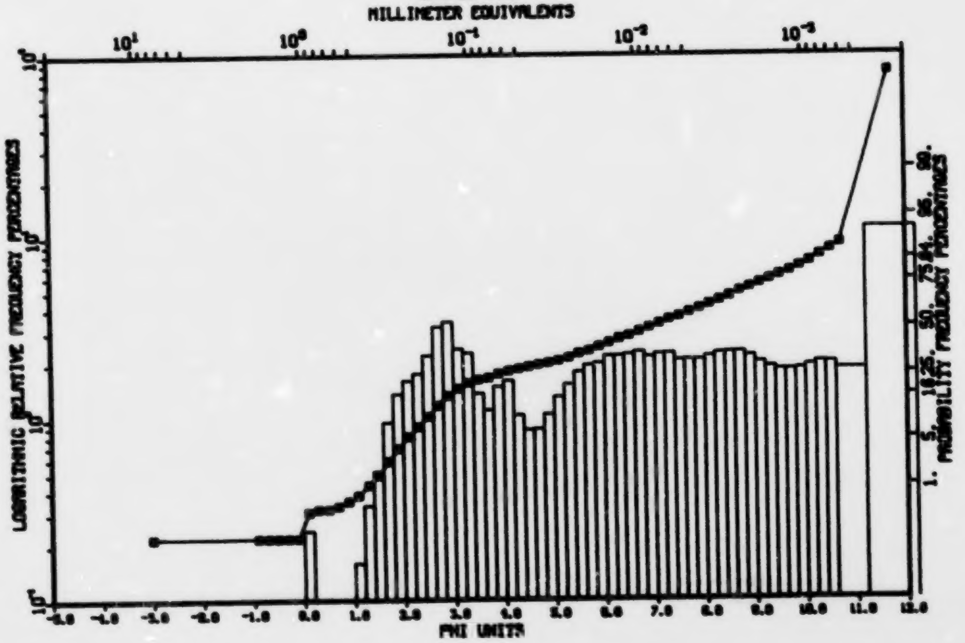
ITD.4 SUBSURFACE HUDSON GRAB
SAMPLE 1983



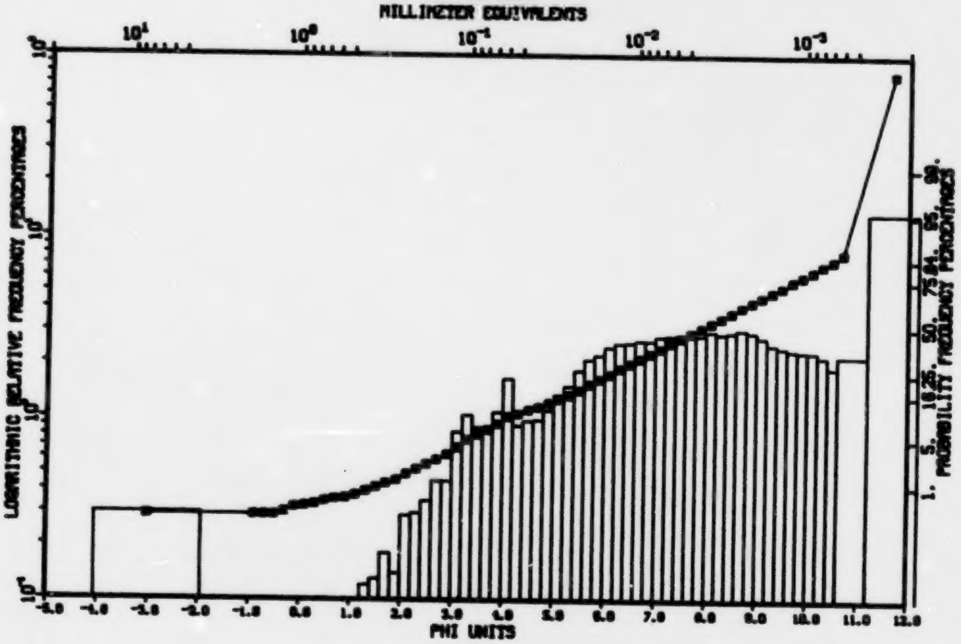
IT1.1 SURFACE HUDSON GRAB
SAMPLE 1884



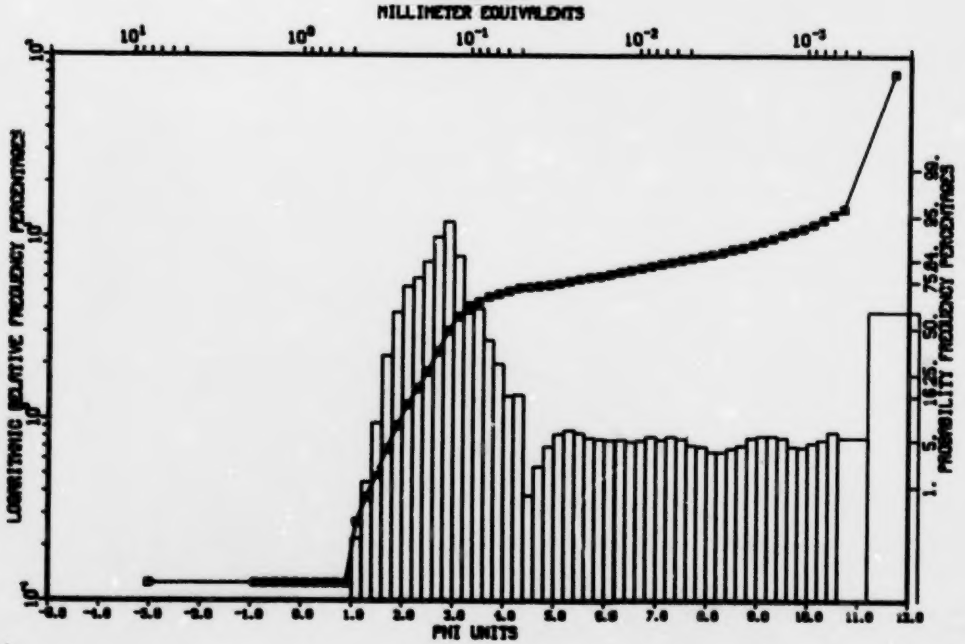
IT1.1 SUBSURFACE HUDSON GRAB
SAMPLE 1885



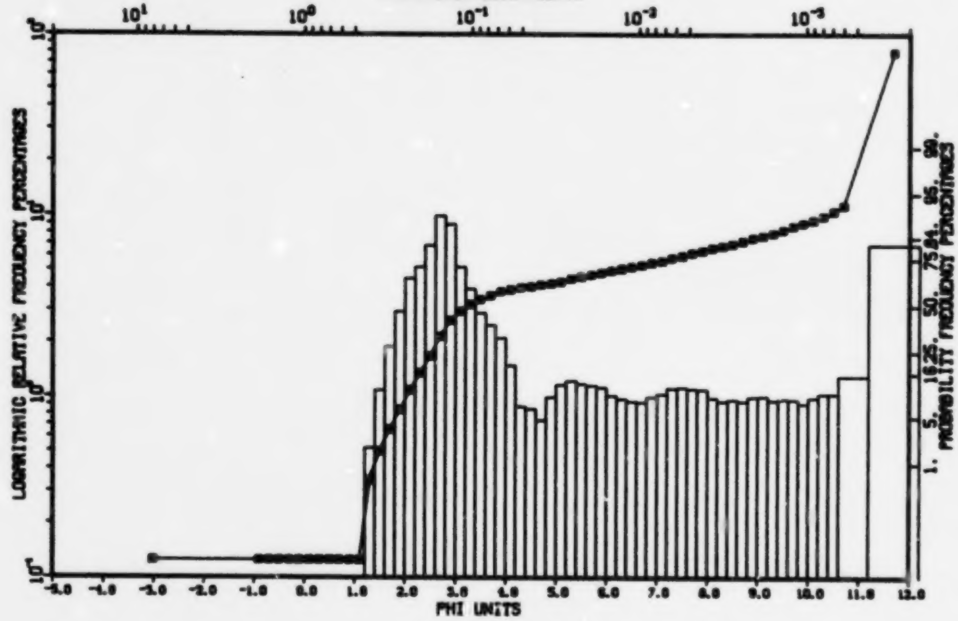
IT1.2 SURFACE HUDSON GRAB
SAMPLE 1986



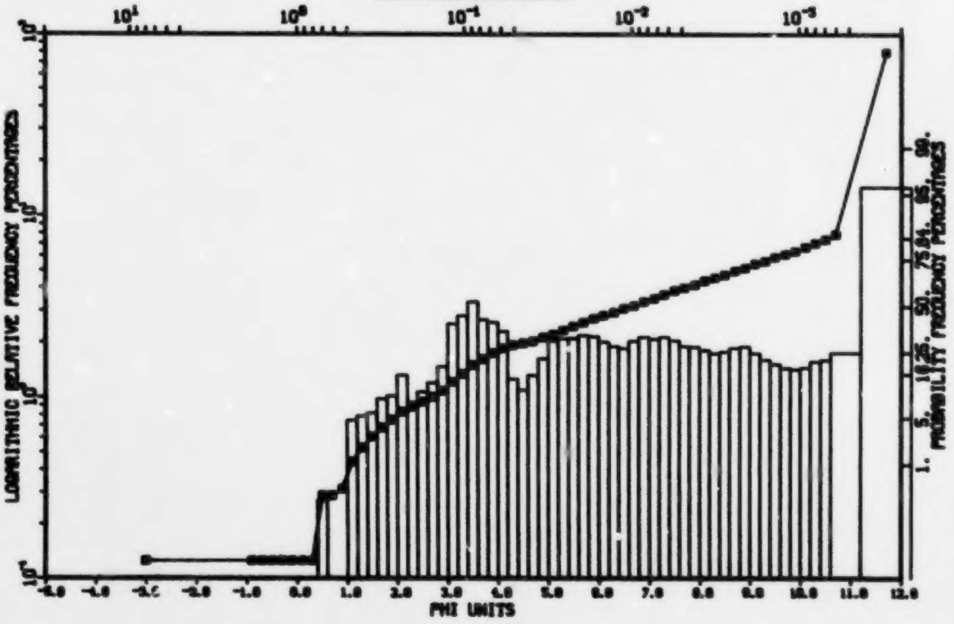
IT2.1 SURFACE HUDSON GRAB
SAMPLE 1987

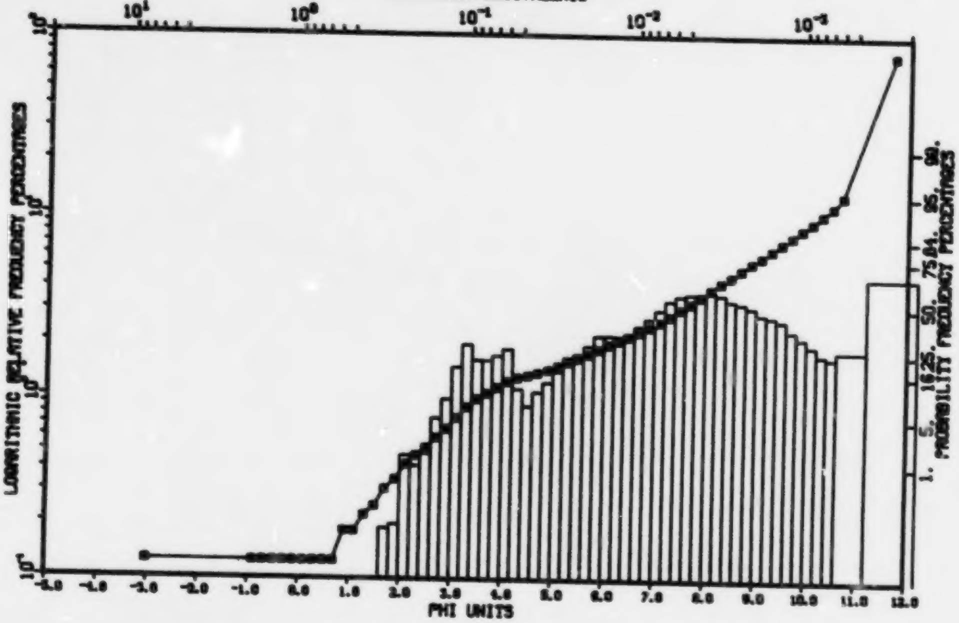


IT2.1 SUBSURFACE HUDSON GRAB
SAMPLE 1984
MILLIMETER EQUIVALENTS

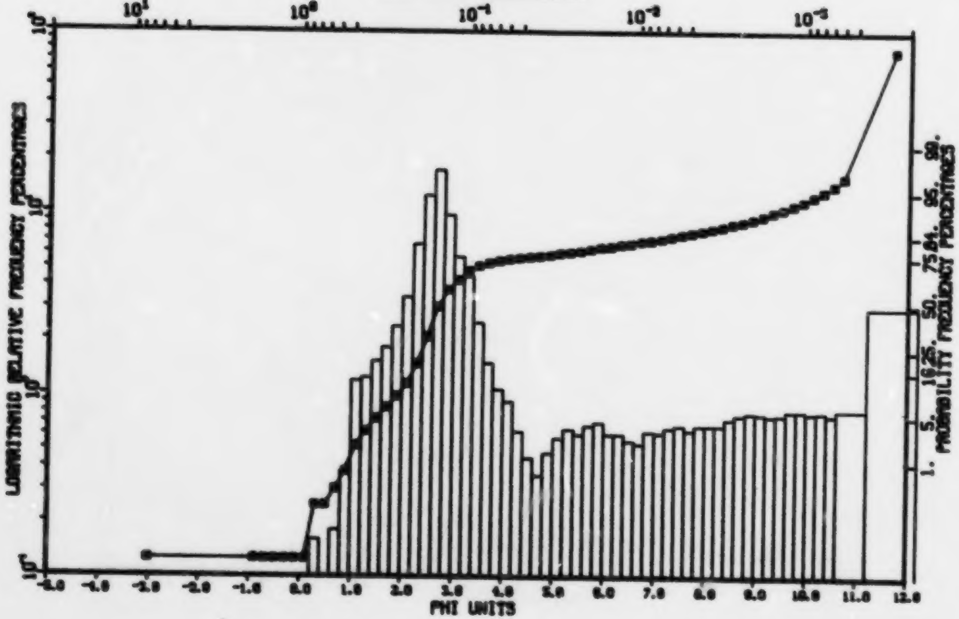


IT2.2 SURFACE HUDSON GRAB
SAMPLE 1988
MILLIMETER EQUIVALENTS



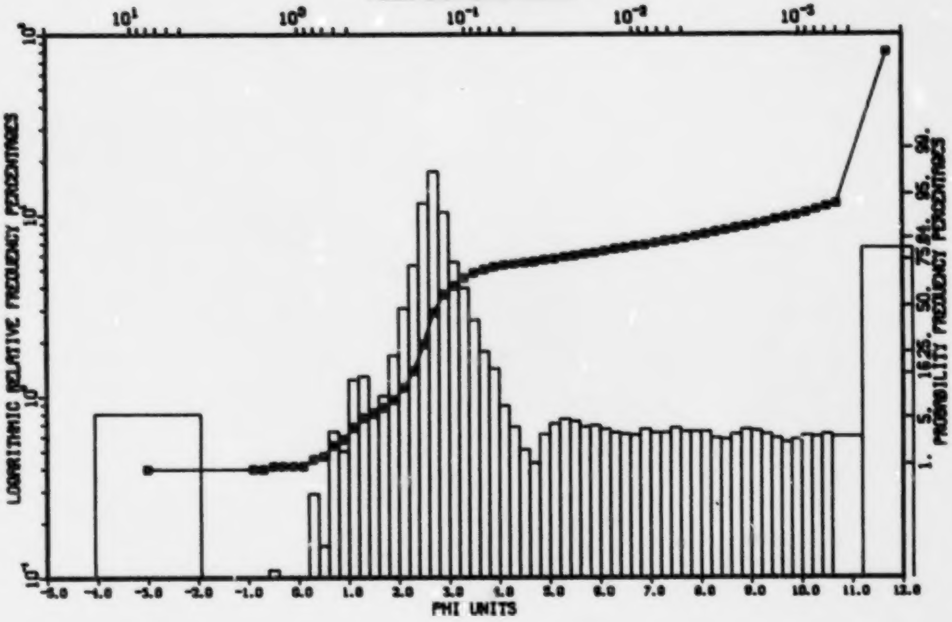


IT2.3 SURFACE HUDSON GRAB
SAMPLE 2000

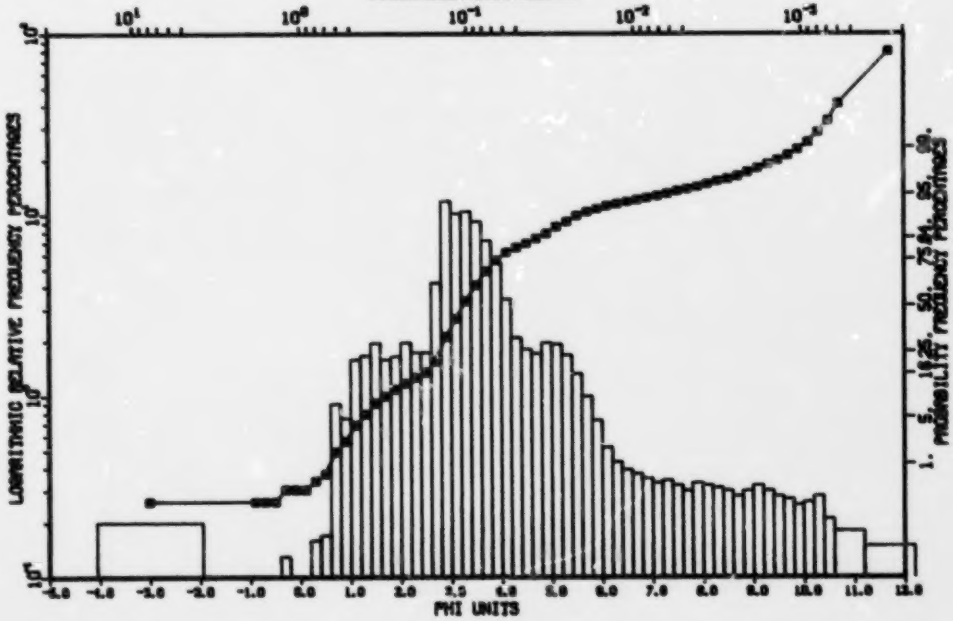


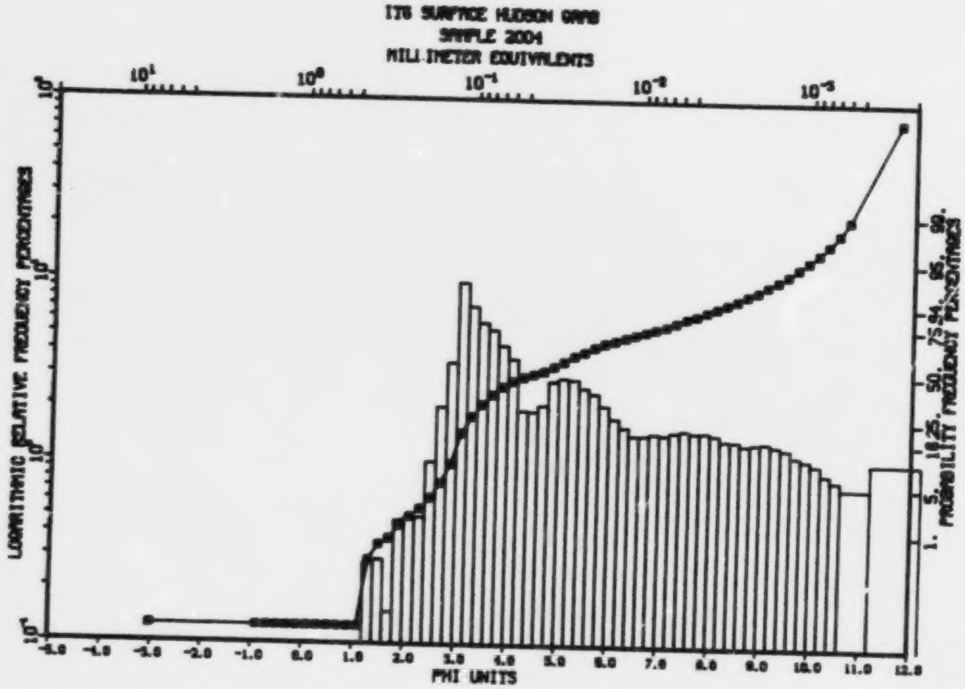
IT3.1 SURFACE HUDSON GRAB
SAMPLE 2001

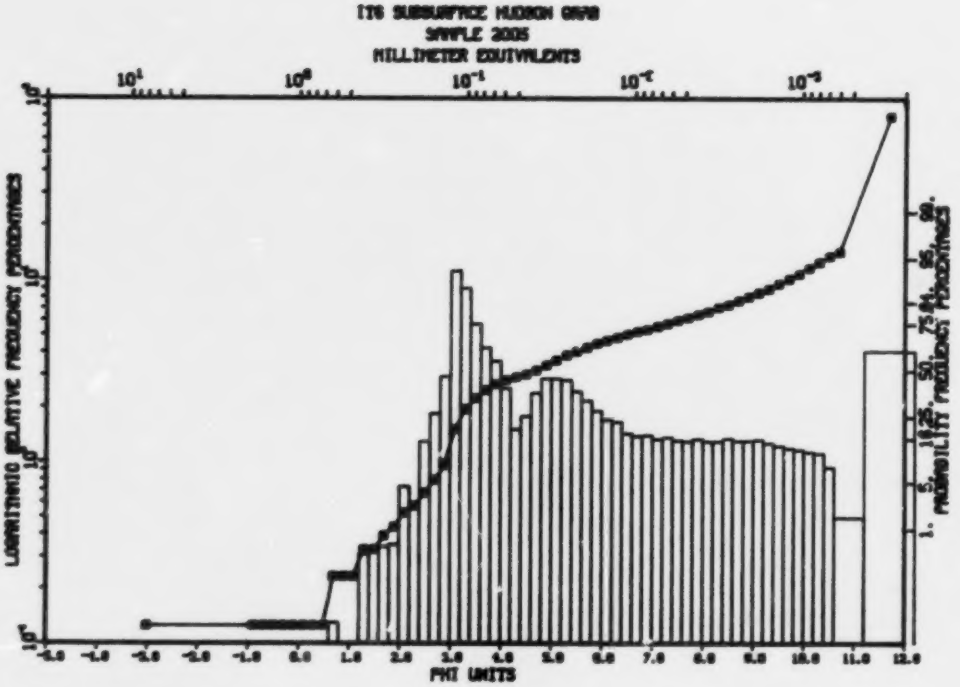
IT3.1 SUBSURFACE HUDSON GRAB
SAMPLE 2002
MILLIMETER EQUIVALENTS



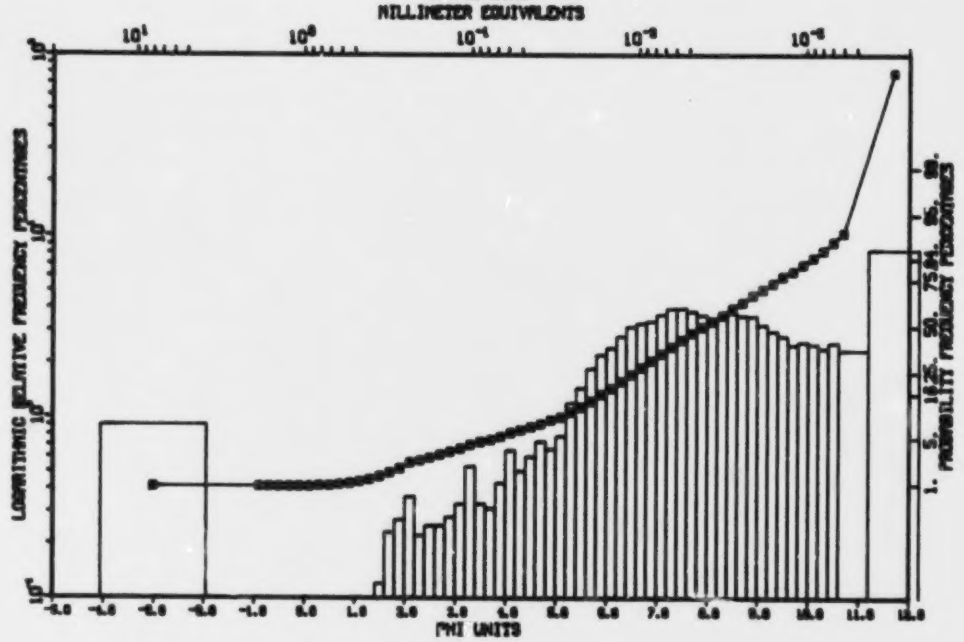
IT5 SURFACE HUDSON GRAB
SAMPLE 2003
MILLIMETER EQUIVALENTS



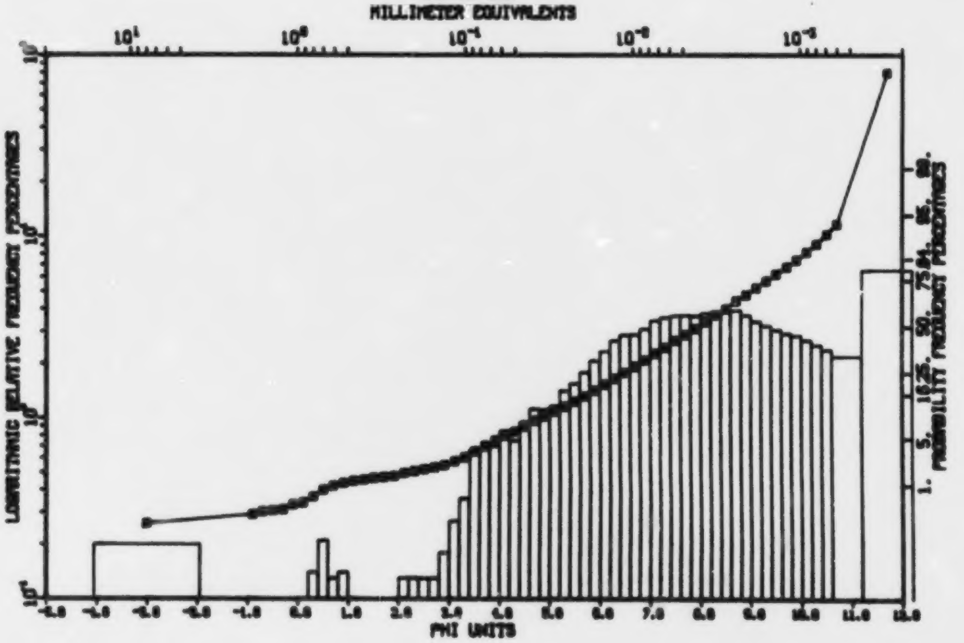

IT6 SURFACE HUDSON GRAB
SAMPLE 2004
MILLIMETER EQUIVALENTS


IT6 SUBSURFACE HUDSON GRAB
SAMPLE 2005
MILLIMETER EQUIVALENTS

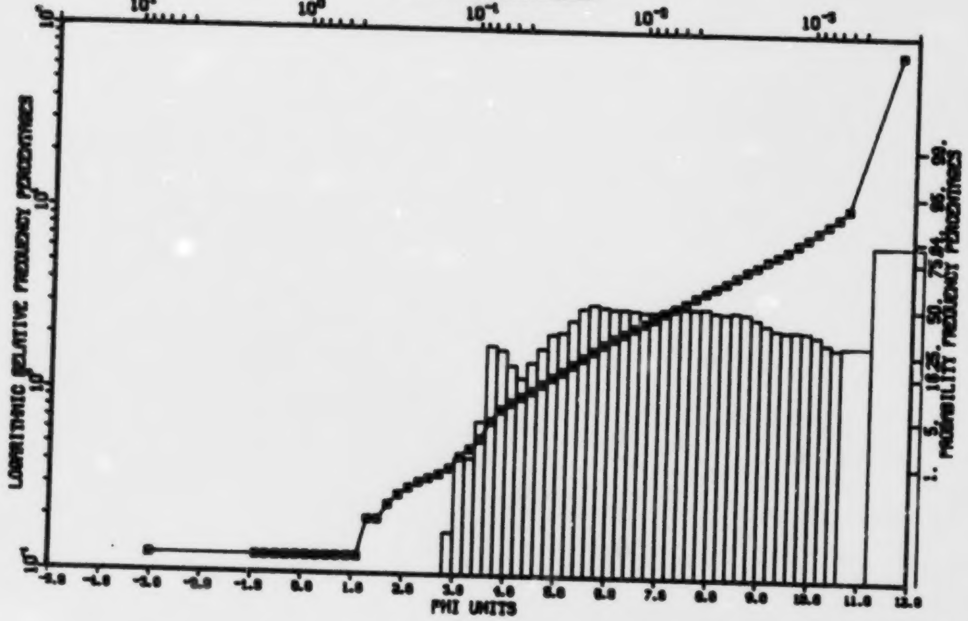
MC0.1 SURFACE HUDSON GRAB
SAMPLE 2006



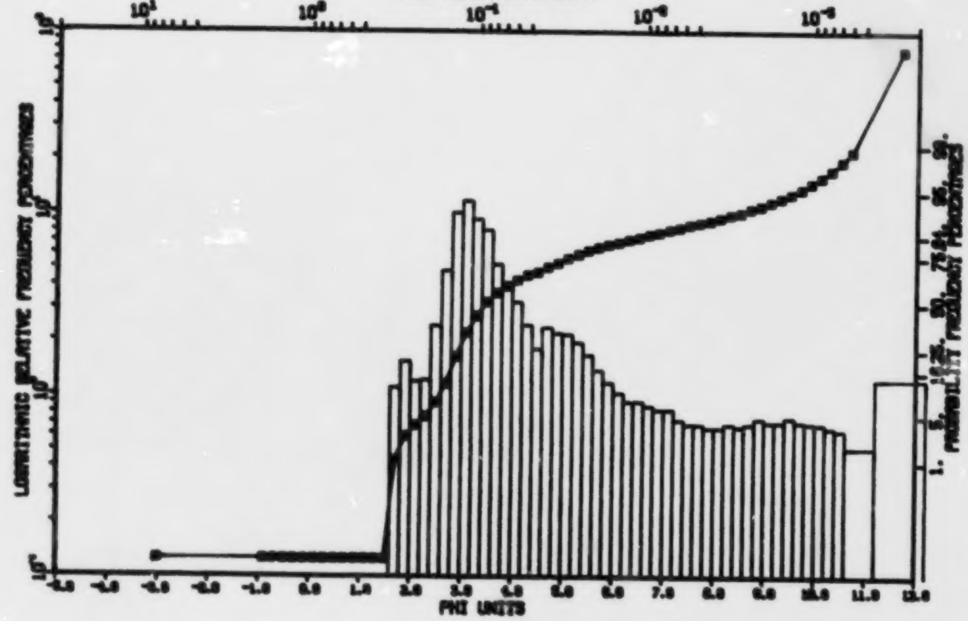
MC2.0 SURFACE HUDSON GRAB
SAMPLE 3007



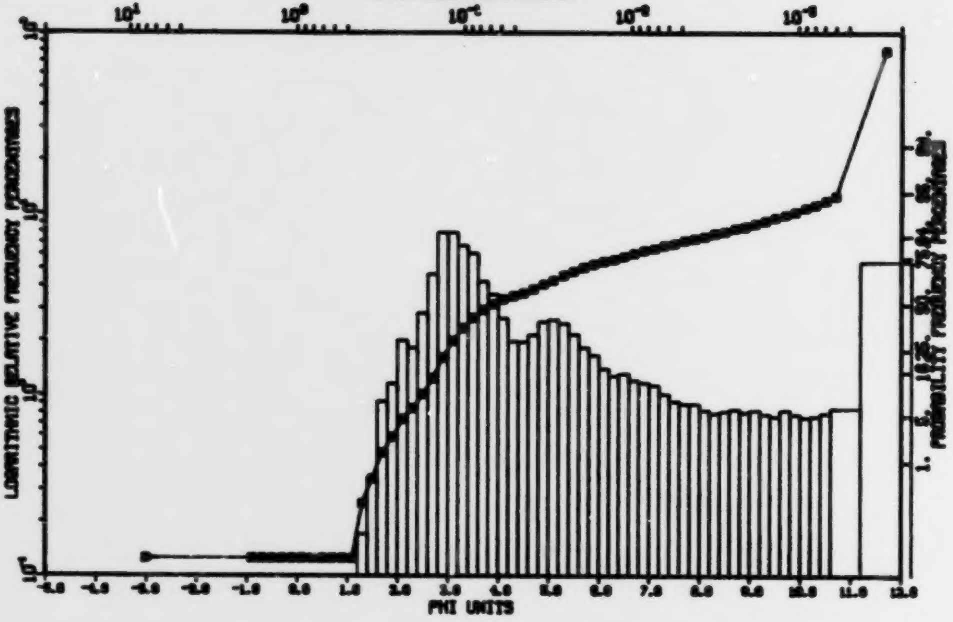
MC2.1 SURFACE HUDSON GRAB
SAMPLE 3008
MILLIMETER EQUIVALENTS



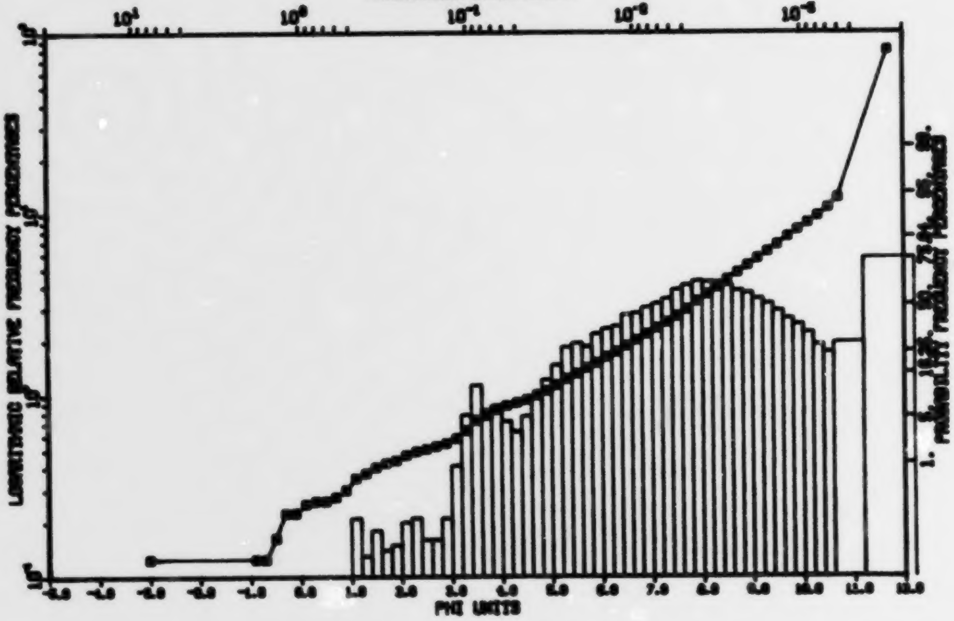
MC4.1 SURFACE HUDSON GRAB
SAMPLE 3009
MILLIMETER EQUIVALENTS

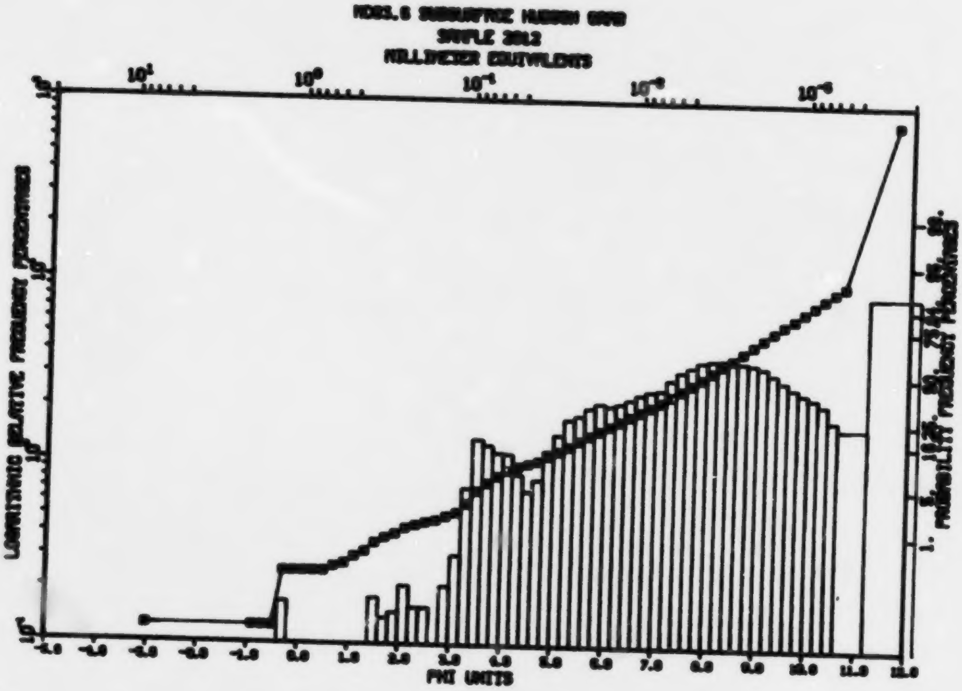


MC4.1 SUBSURFACE HUDSON GRAB
SAMPLE 2010
MILLIMETER EQUIVALENTS

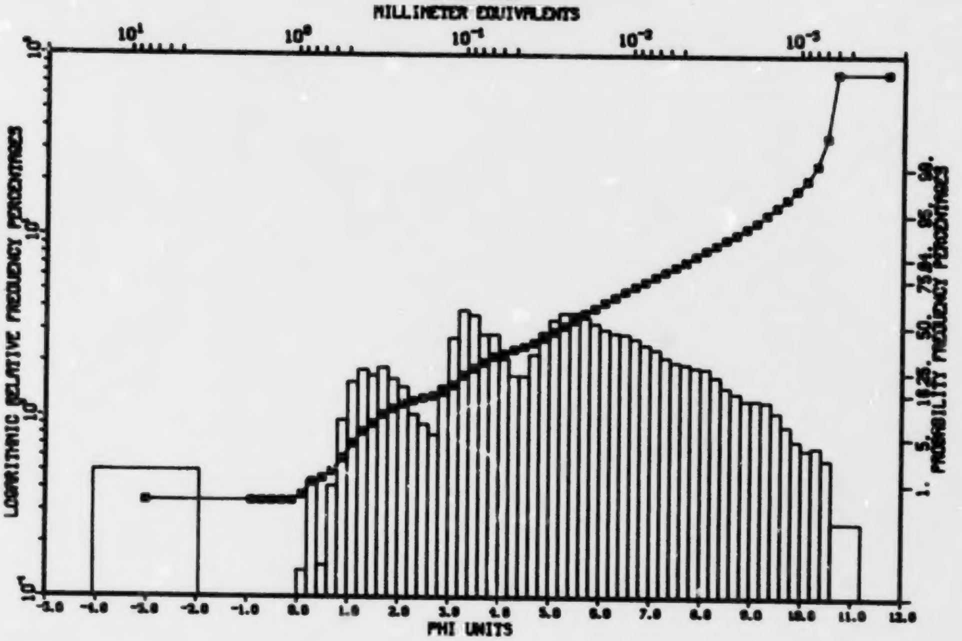


MC85.6 SURFACE HUDSON GRAB
SAMPLE 2011
MILLIMETER EQUIVALENTS

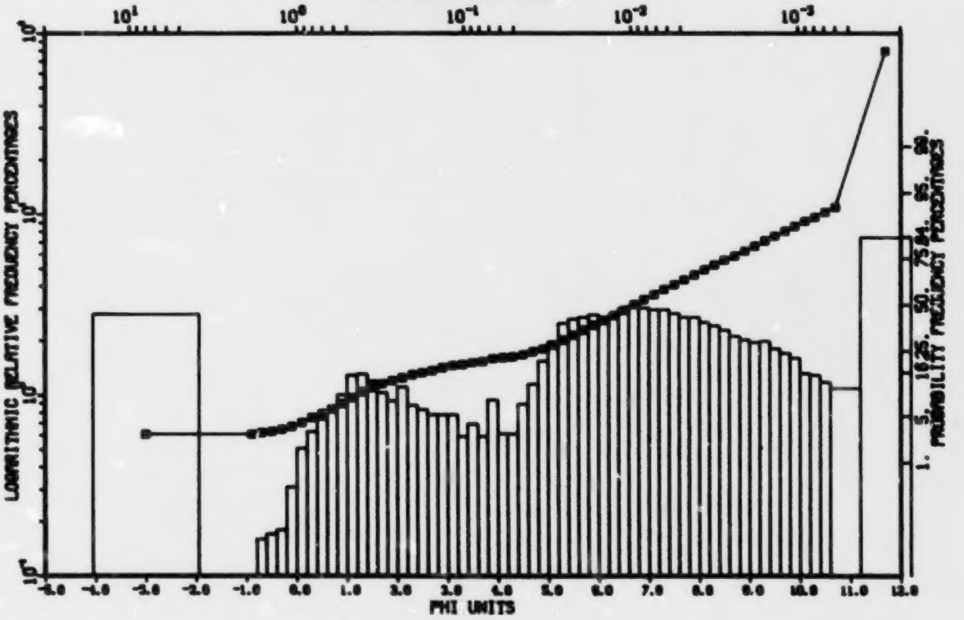



MD81.6 SUBSURFACE HUDSON GRAB
SAMPLE 2012
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY (PERCENTAGES)
PROBABILITY FREQUENCY PERCENTAGES
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
PHI UNITS

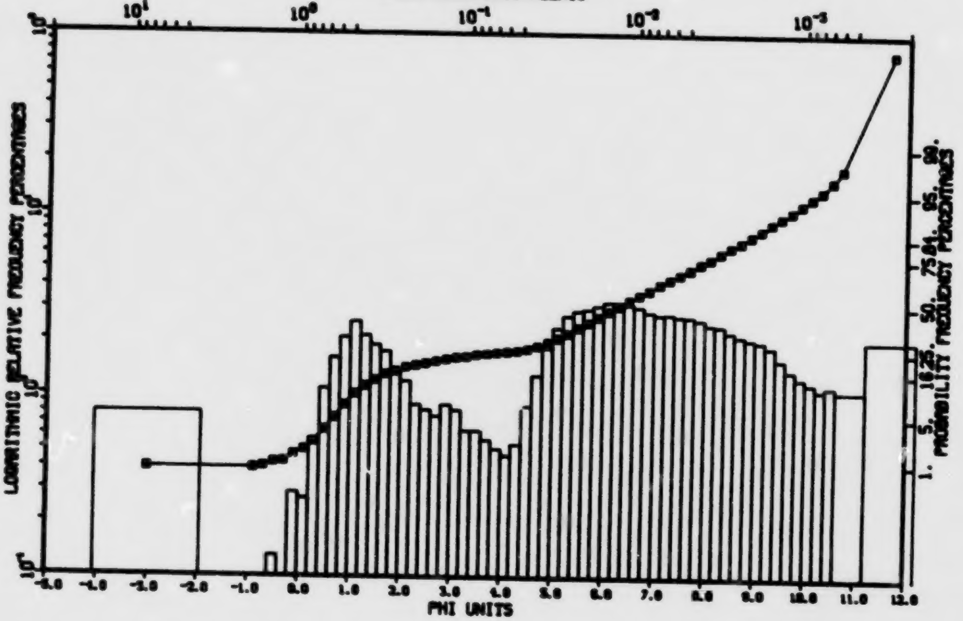
CRD.2 SURFACE HUDSON GRAB
SAMPLE 2013



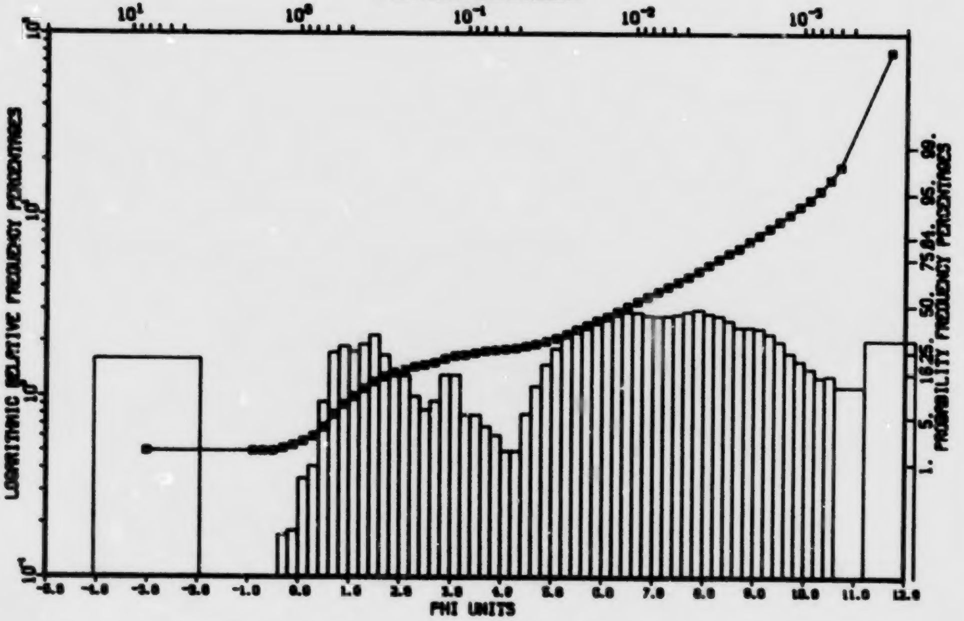
CRD.3 SURFACE HUDSON GRAB
SAMPLE 2014



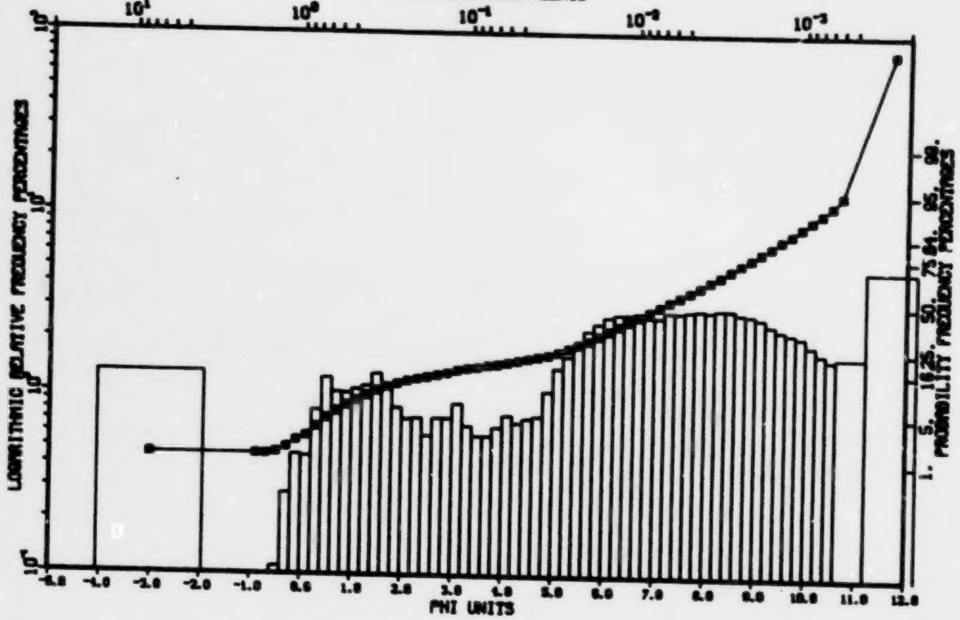
CM1.0 SURFACE HUDSON GRAB
SAMPLE 2015
MILLIMETER EQUIVALENTS



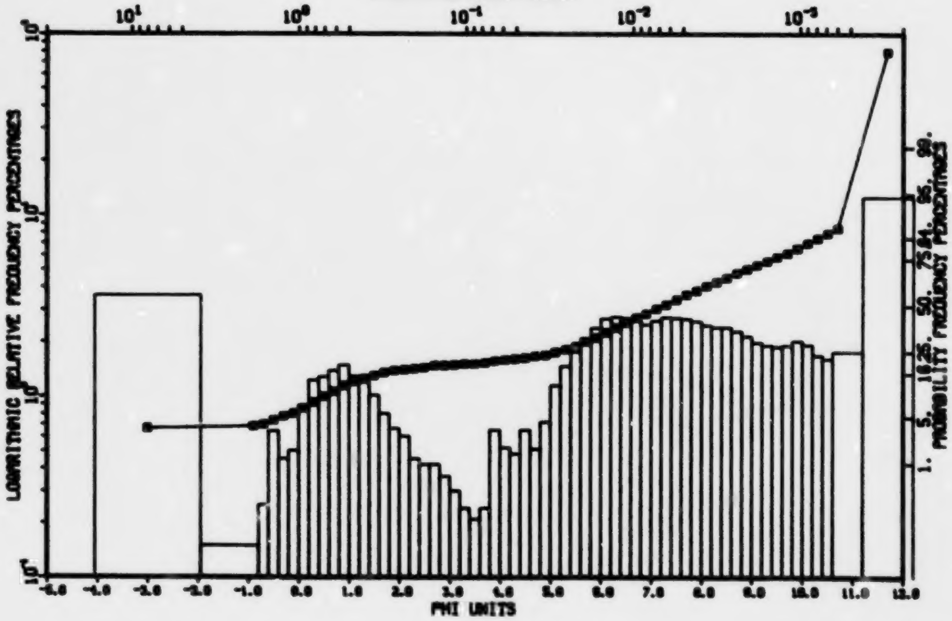
CM1.2 SURFACE HUDSON GRAB
SAMPLE 2016
MILLIMETER EQUIVALENTS



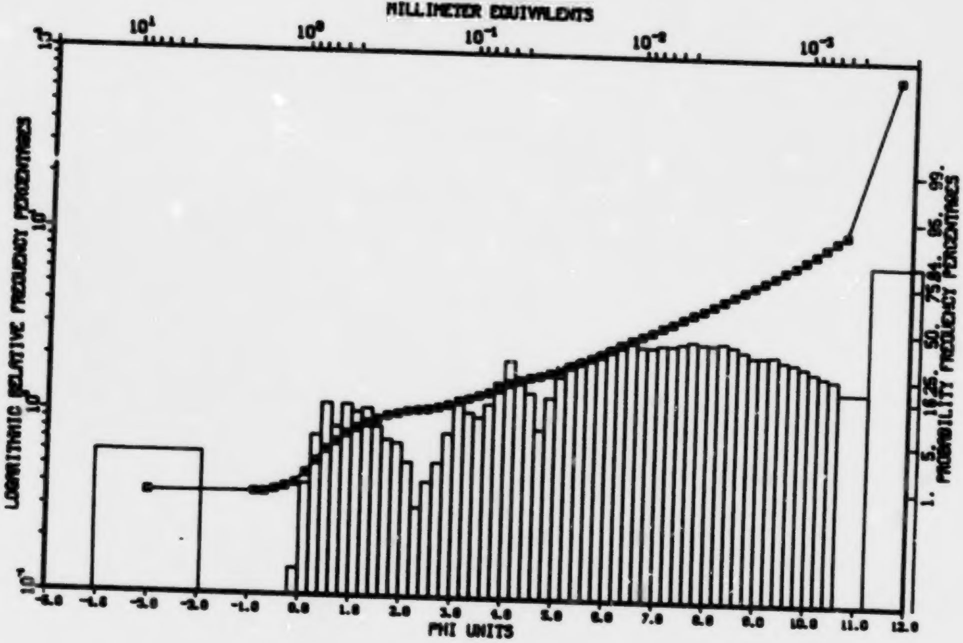
GR1.3 SURFACE HUDSON GRAB
SAMPLE 2017



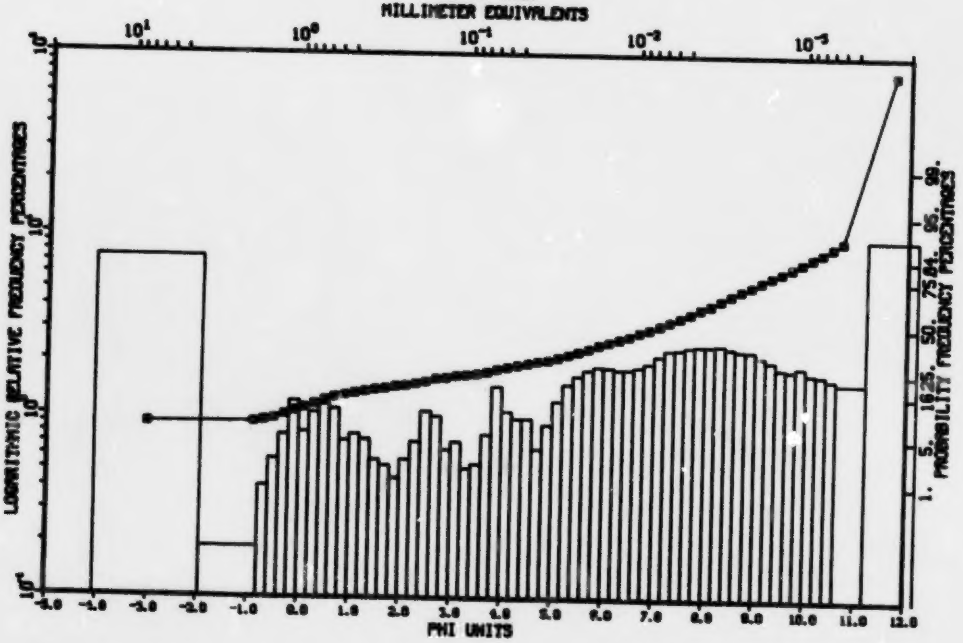
GR1.4 SURFACE HUDSON GRAB
SAMPLE 2018



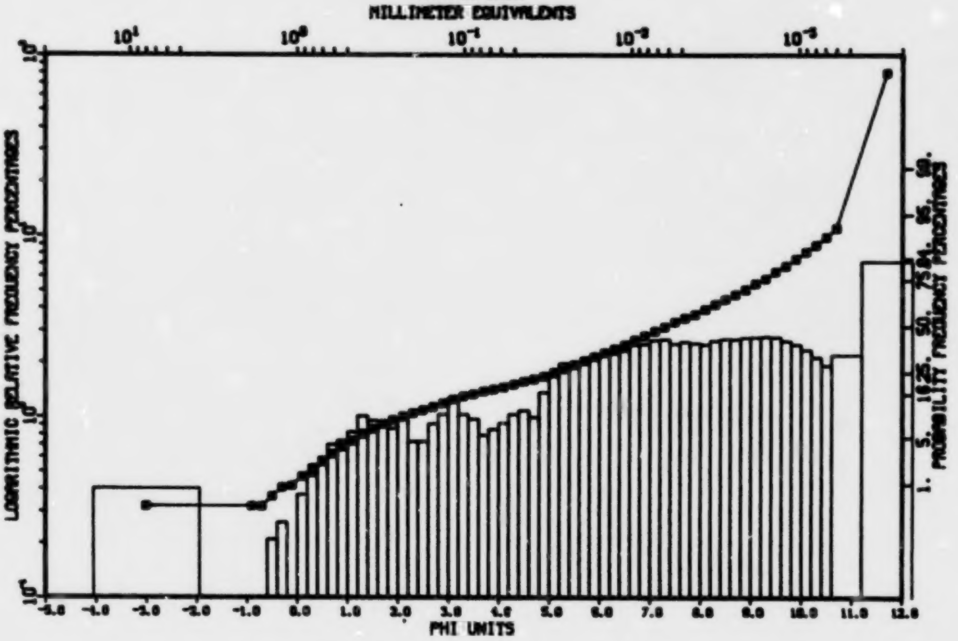
CA1.5 SURFACE HUDSON GRAB
SAMPLE 2019



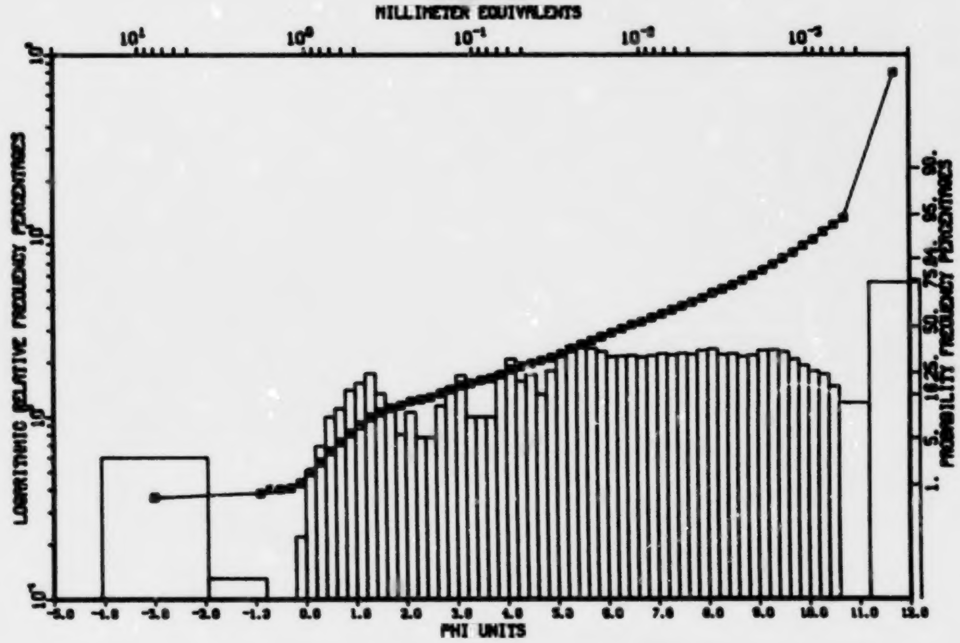
CA1.7 SURFACE HUDSON GRAB
SAMPLE 2020



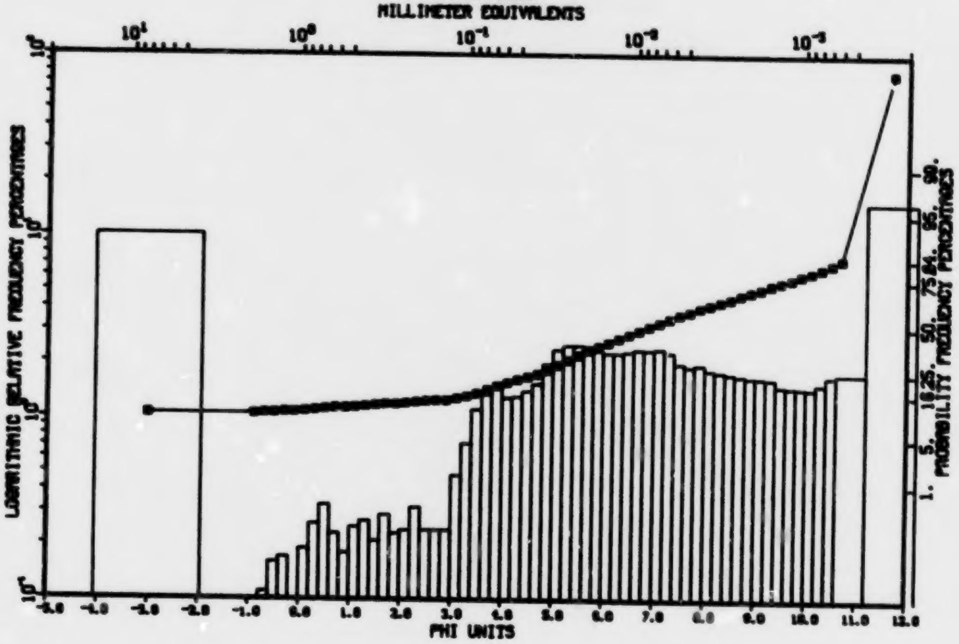
CR1.7 SUBSURFACE HUDSON GRAB
SAMPLE 2021



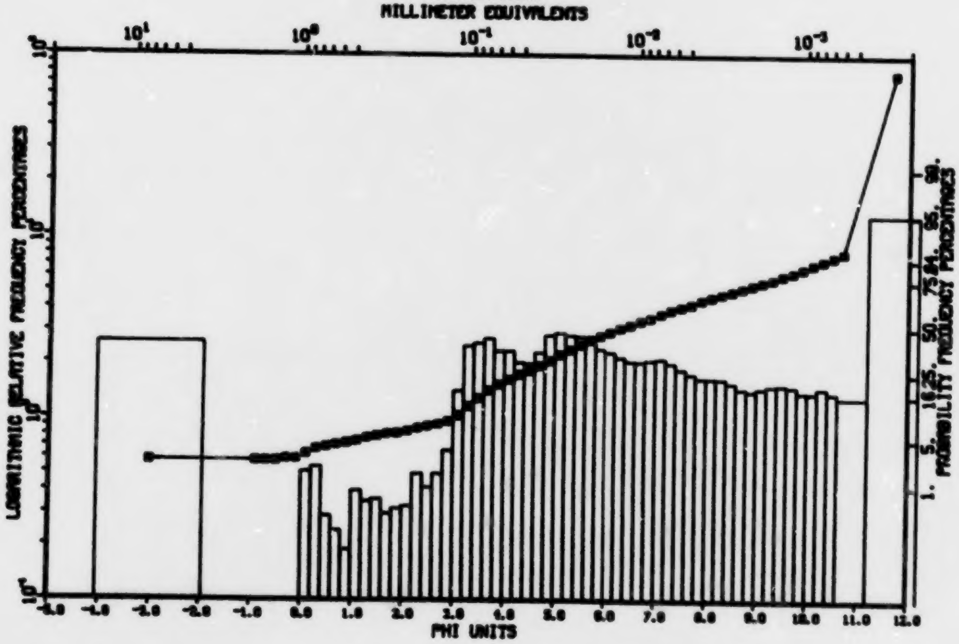
CR2.2 SURFACE HUDSON GRAB
SAMPLE 2022



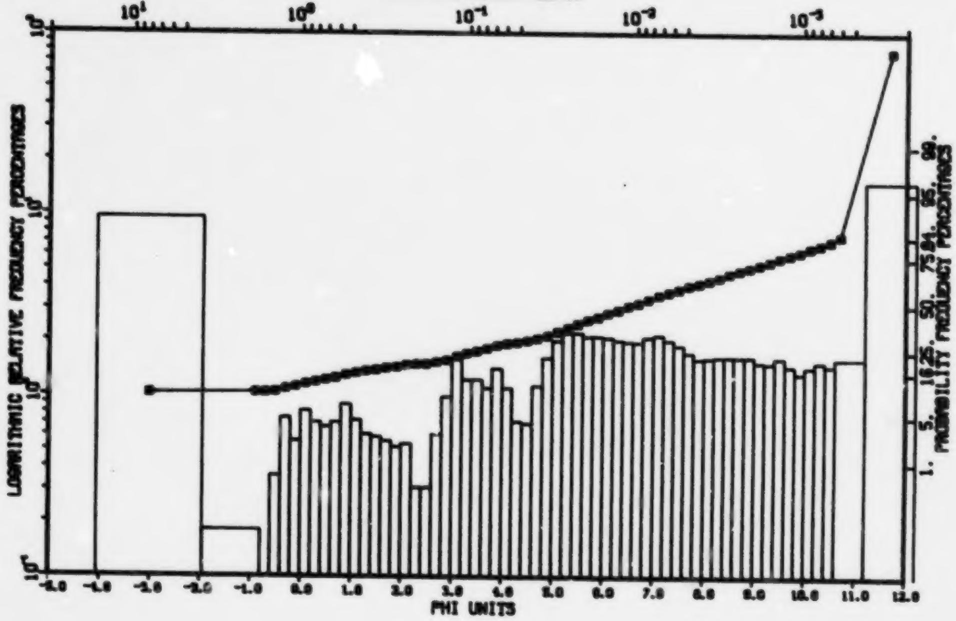
CMS GRAB=1 SURFACE HUDSON GRAB
SAMPLE 2023



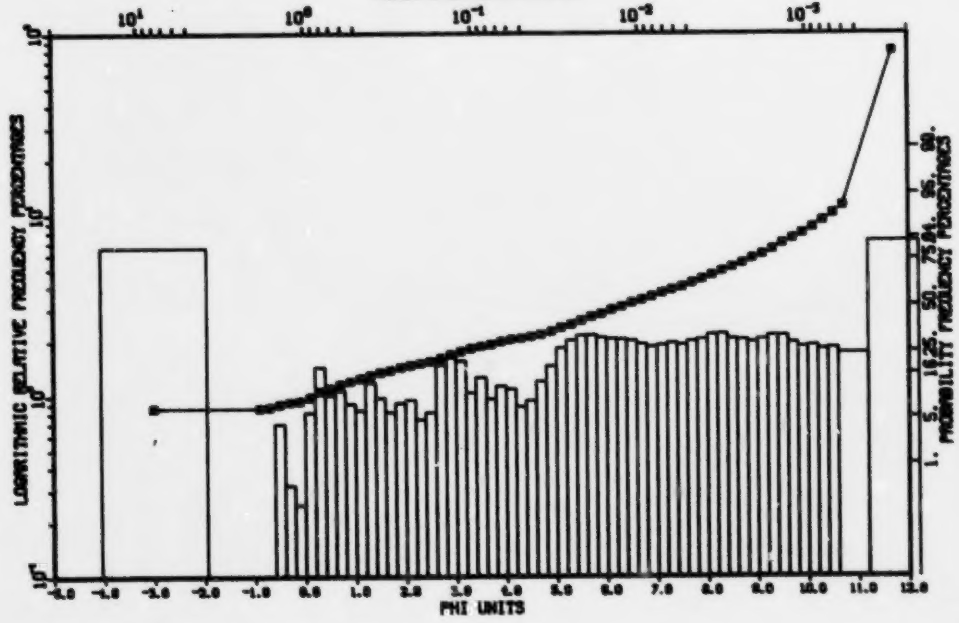
CMS GRAB=2 SURFACE HUDSON GRAB
SAMPLE 2024



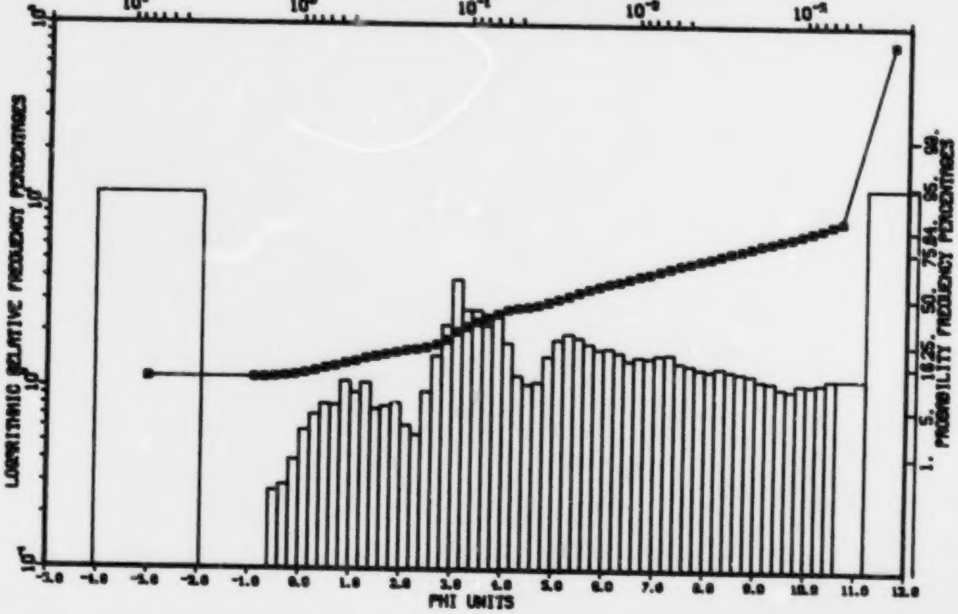
CR3 GRAB=3 SURFACE HUDSON GRAB
SAMPLE 2025
MILLIMETER EQUIVALENTS



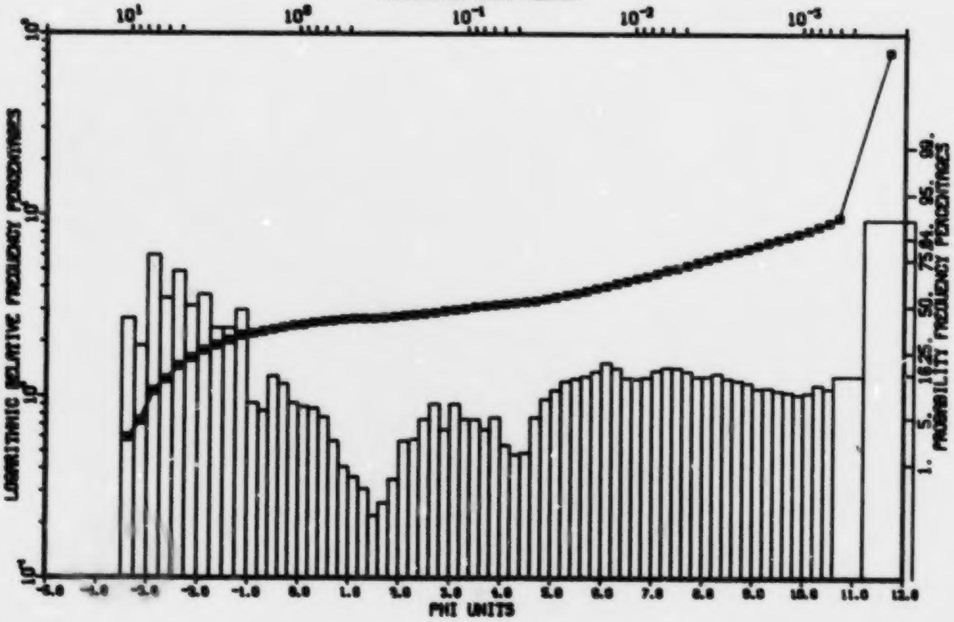
CR3 GRAB=4 SURFACE HUDSON GRAB
SAMPLE 2026
MILLIMETER EQUIVALENTS



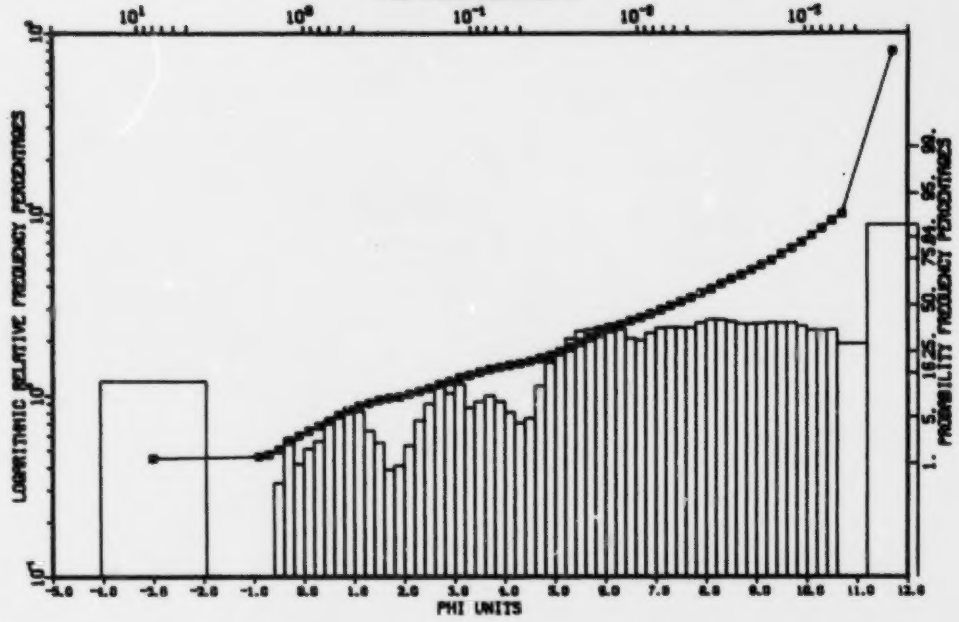
CR3 GRAB=5 SURFACE HUDSON GRAB
SAMPLE 2027
MILLIMETER EQUIVALENTS



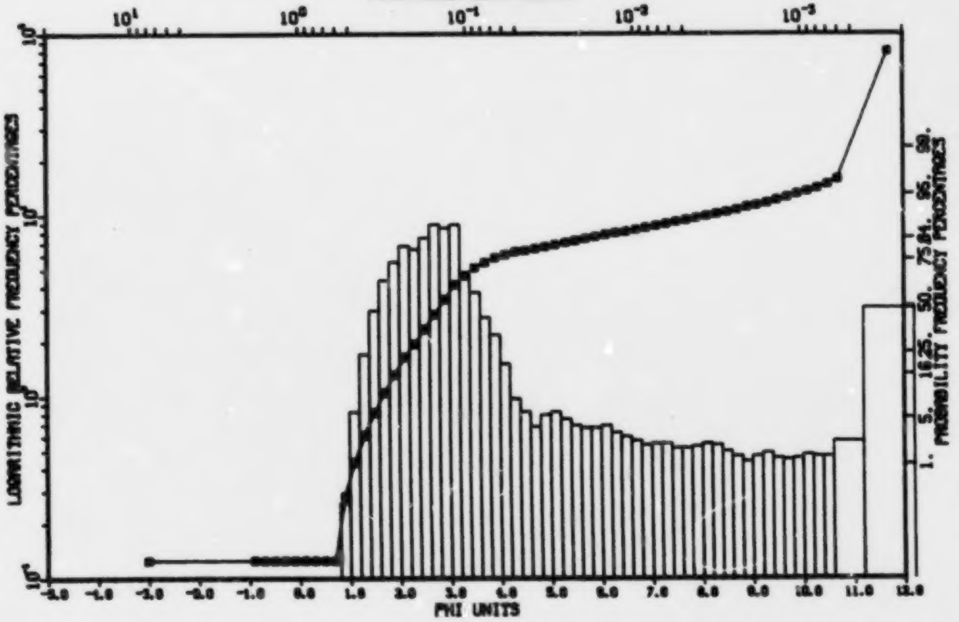
CR4.1 SURFACE HUDSON GRAB
SAMPLE 2028
MILLIMETER EQUIVALENTS



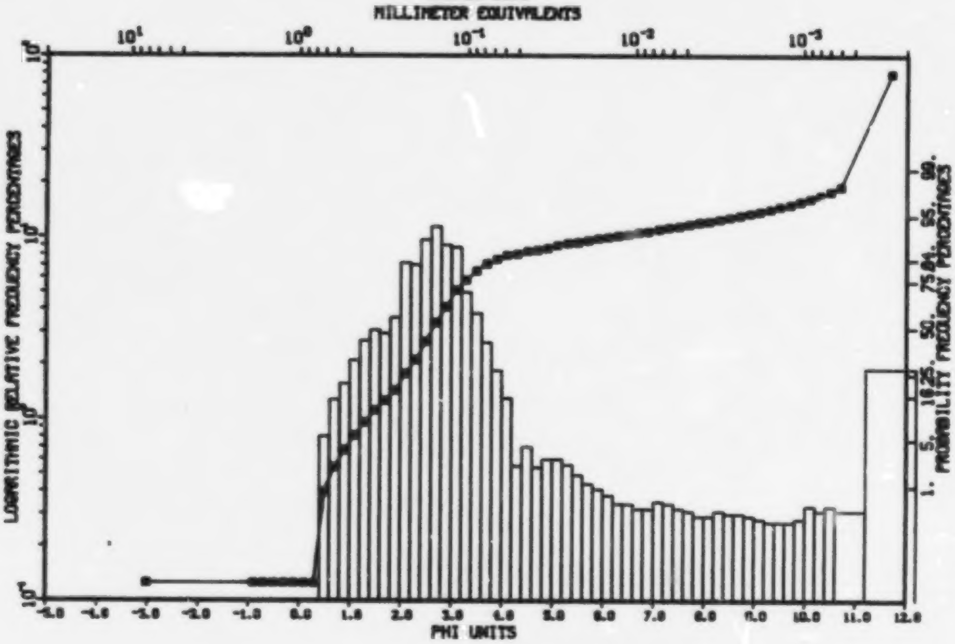
CM4.1 SUBSURFACE HUDSON GRAB
SAMPLE 2029
MILLIMETER EQUIVALENTS



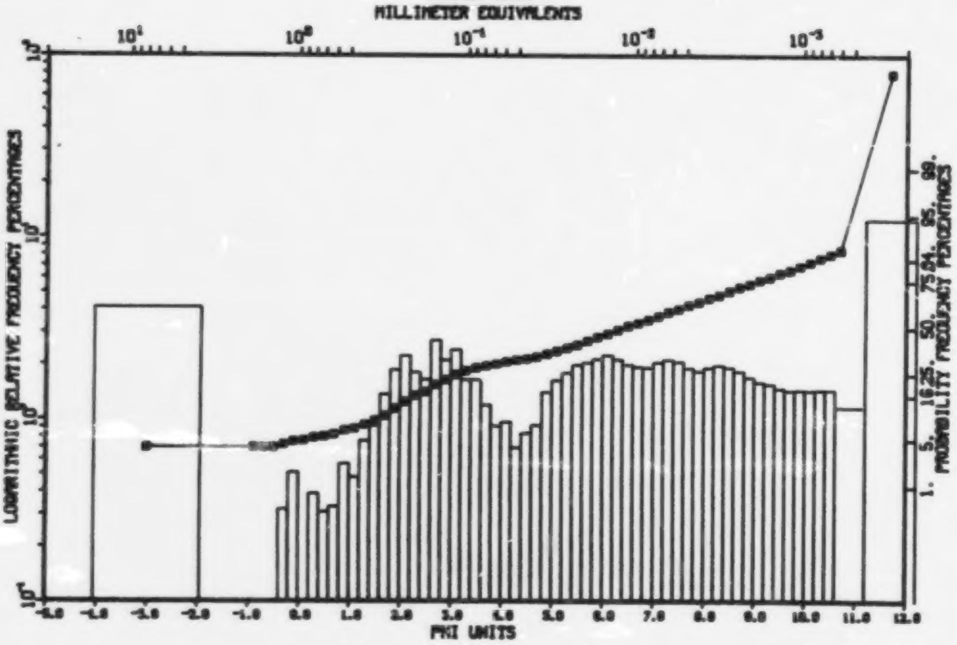
CM4.2 SURFACE HUDSON GRAB
SAMPLE 2030
MILLIMETER EQUIVALENTS



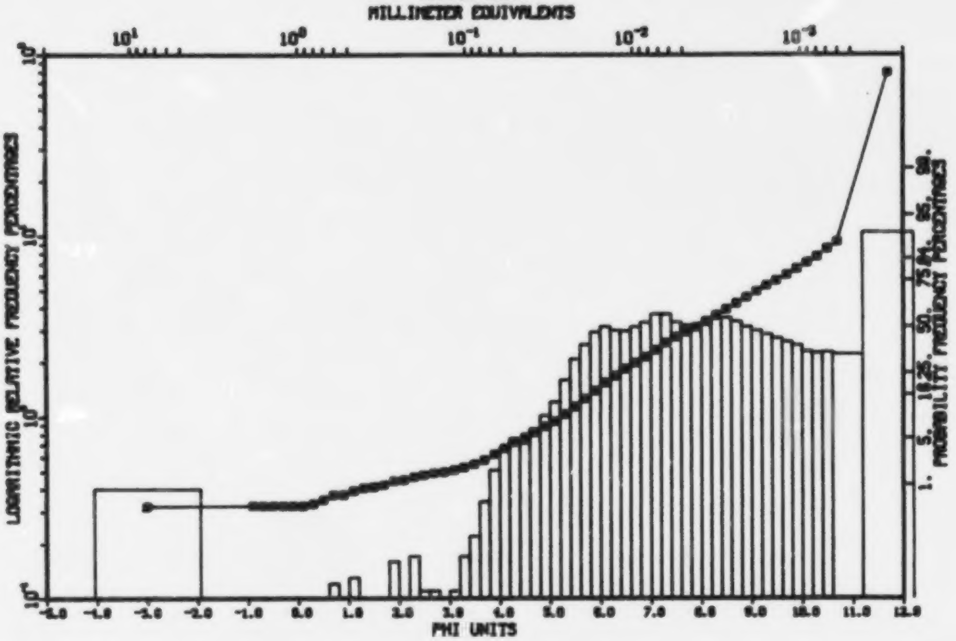
CAM.2 SUBSURFACE HUDSON GRAB
SAMPLE 2031



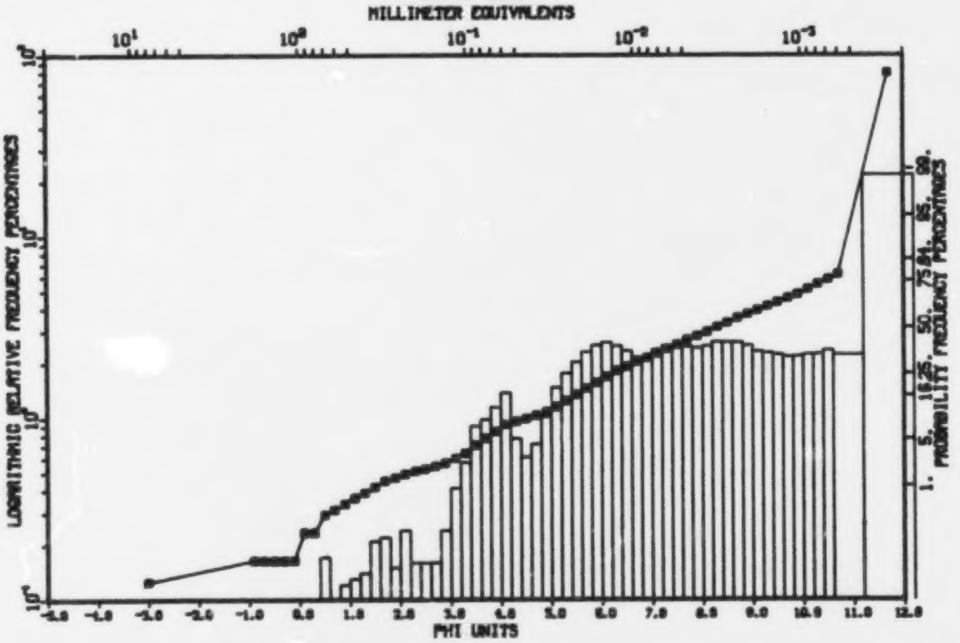
CAM.3 SURFACE HUDSON GRAB
SAMPLE 2032



CR8.1 SURFACE HUDSON GRAB
SAMPLE 2033



CR7.1 SURFACE HUDSON GRAB
SAMPLE 2034



8-1

OBSERVATIONS ON RAFTING OF PEBBLES BY ALGAE IN THE LITTORAL ZONE OF MCBETH FIORD, BAFFIN ISLAND

Robert Gilbert
Department of Geography, Queen's University,
Kingston Ontario, K7L 3N6

In an earlier report Gilbert (1984) showed that the alga, Fucus vesiculosus is capable of transporting sedimentary particles from about 5 to 90 mm diameter in the intertidal environment of Pangnirtung Fiord. Two mechanisms are involved in this process: the stone is floated when the wet biomass of Fucus exceeds about 3 times the weight of the stone, and when the biomass of Fucus is less, the form drag and lift which it provides allow moderate tidal currets to move very much larger stones than would be possible otherwise.

During brief visits to four locations on the shores of McBeth Fiord on September 30, 1983 (figure 1) similar observations were made of the movement of stones from the subtidal to the beach by algae, as a result of a single storm event. Two days previously on September 27 and 28 a storm occurred with light snow and strong winds from the northeast. No direct observations are available from McBeth Fiord, although the data from Clyde (120 km northeast of the fiord) in figure 2 indicate 43 hours of east to north winds with mean velocity of 21.1 km/h. On the 28th the strongest winds occurred in an 11 hour period with mean velocity 27.2 km/h and maximum velocity of 46 km/h. In fiords where the winds are funneled, it is probable that the wind velocities were somewhat higher. For example in Itirbilung Fiord, 25 km to the south of McBeth Fiord, winds recorded on C.S.S. Hudson reached about 60 km/h on the 28th.

Site 1 (figure 1) is located in a small bay formed by a side entry calving glacier. Fucus sp. was observed at depths of about 1 to 3 metres partially covering cobbles and boulders of the laterial moraine along the east side of the bay. However, there was no evidence of Fucus fragments on the shores in the vicinity. It is probable that the protection offered by the bay was sufficient that the storm waves from the east were not able to disrupt the algae or the sediments. It is also probable that the large stones of the moraine provided an immoveable base for the algae.

Site 2 is a gravel beach at the base of a raised marine delta and beach sequence (figure 3). The beach faces northeast and is exposed to waves passing upfiord. The presence of a storm berm just above the high tide line as marked by the limit of snow in figure 3 indicates a relatively high energy environment at this location. A wind-row of algal debris was found 0.42 m below the high water mark (figures 3 and 4). In a section of the beach 100 m long a collection of algae was made which included 169 specimens of Fucus sp. and 28 specimens of Laminaria sp. each complete with stipe and holdfast. Of these 35% of the fucoid algae and 75% of the laminarians had stones attached (figure 6).

The maximum fetch at site 2 is 17 km and the effective fetch (Beach Erosion Board, 1972) is 5.2 km (central radial is 095°T), although because the winds are funneled along the fiord, the actual effective fetch is probably somewhat greater. The significant wave height, H_s, and period, T_s calculated from equations given by Smith and Sinclair (1972) are $H_s = 0.50$ m and $T_s = 2.85$ s for wind speed of 27.2 km/h and effective fetch assumed to be 10 km. The maximum orbital velocity is 0.55 m/s and the wave base is 3 m (Sly, 1978). But even at maximum wind velocity of 46 km/h the orbital velocity at 1 m depth is 0.20 m/s, sufficient to transport only medium sand (Johnson, 1980). However, calculations by Gilbert (1984) indicate that orbital velocity of 0.2 to 0.5 m/s may transport stones of up to 100 mm diameter with attached Fucus of 2 to 1 kg.

None of the fucoid algae had prominent vesicles and none floated with the attached stones when placed in sea water. However, it is probable that the algae were eroded by wave action and carried from a bed about ten metres offshore and 1.5 to 2.1 metres below low tide (figure 4). This is well within the zone of wave action for the storm waves estimated at this site. No laminarians were found growing anywhere in the vicinity, although they made up a significant portion of the beach debris. It is probable, however, that they were locally derived from slightly deeper water. Lee (1980) indicates that the range of laminarians is about 3 to 13 m.

The size distribution of the stones attached to the fucoid algae from McBeth Fiord is almost identical to that recorded in Pangnirtung Fiord (figure 5), with geometric mean grain size based on individual particles of 37.2 mm and 38.1 mm respectively. The largest single stone recovered from McBeth Fiord was 558 g (equivalent spherical diameter 73.4 mm), and from Pangnirtung Fiord 1036 g (90.2 mm).

The holdfast of the fucoid algae has a single attachment point on the substratum, so invariably only one stone is found attached to an individual plant (figure 6a). On the other hand, the many fine branches of the laminarian holdfast allow more particles to be attached to a single plant, and because of the branched holdfast, the laminarian algae may grow on sandy bottoms. Thus the particles brought ashore are more numerous, but much smaller (comprising largely coarse sand and fine pebbles) than those attached to the fucoid algae.

Site 3 (figure 1) is a beach and alluvial fan protected from easterly winds. On about 1.5 km of shoreline surveyed at this site there was no recent algal debris. Site 4 is a small sand beach at the foot of a large raised delta. Wave height here is probably significantly less than at site 2 because of the constriction in fiord width 10 km to the east. Here only 4 clumps of fucoid algae with stones attached were found on the beach. The equivalent spherical diameters of the stones ranged from 15.2 mm to 46.9 mm. Several fragments of laminarians were found but none was complete with stipes and holdfasts, so no stones were attached.

While the movement of stones attached to algae is almost certainly not the most important processes of sediment transport in the littoral environments of the fiords of Baffin Island, there is now evidence that it does occur widely from the south at Pangnirtung Fiord at least to north central Baffin at McBeth Fiord. The same processes have been observed in Frobisher Bay (Gilbert, unpublished data), central Labrador (Gilbert et al., 1982), Newfoundland (Hooper, personal communication), the Gulf of St Lawrence (Dionne, 1965), and in Europe (Kudrass, 1974).

The process is worthy of consideration for a number of reasons. Significant quantities of sediment coarser than might otherwise be transported are moved from the subtidal environment to the beach face. Over an extended period this may be important in building up the beach. Pebbles and cobbles may become incorporated into sand beaches in this manner (as at site 4). In some circumstances the sediment may be transported offshore to deep water where it is indistinguishable from ice rafted sediment. Ice rafting is facilitated as the algae are easily frozen into sea ice. Mats of algae with stones shells and other debris are frequently found incorporated into sea ice.

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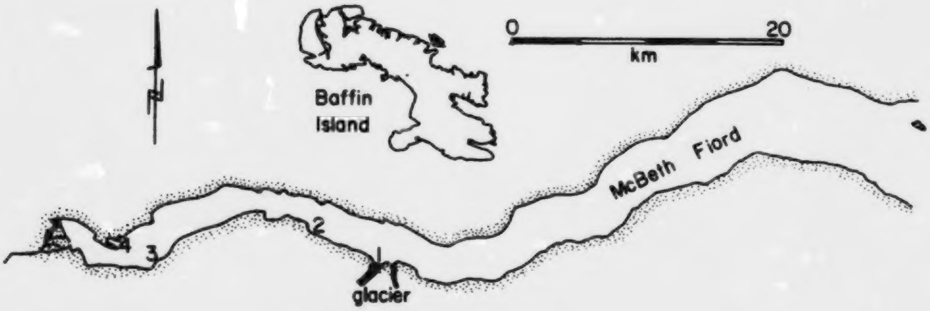

FIGURE1. Outline map of McBeth Fiord showing the locations of the sampling sites.

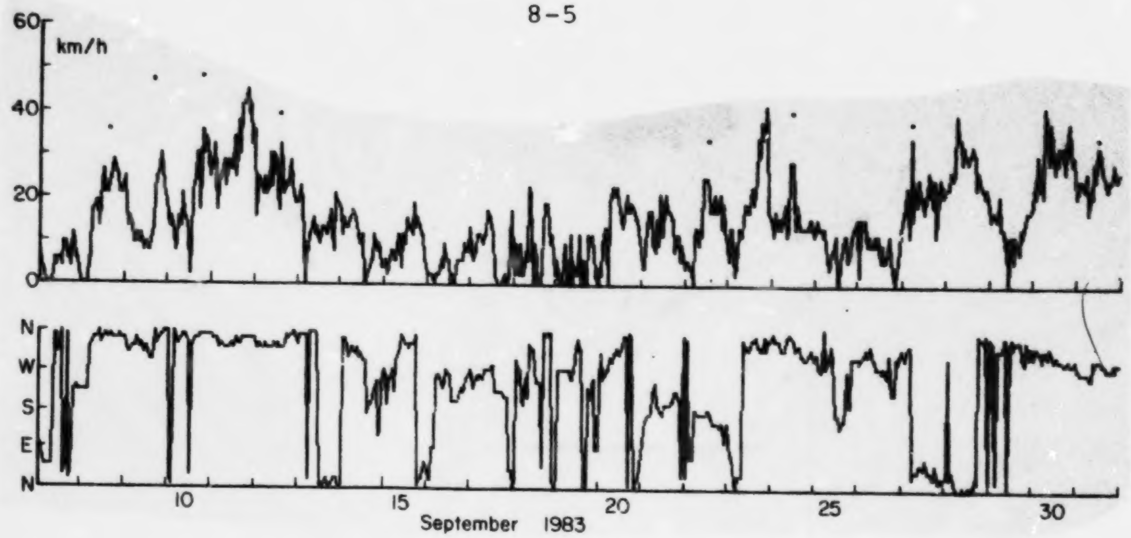

FIGURE 2. Mean hourly wind velocity and direction at Clyde from September 7 to October 1, 1983. Dots above the velocity record indicate maximum recorded velocities.

FIGURE 3. View along the beach at site 2 showing the algal debris line. Profile shown in figure 4 is in the foreground.

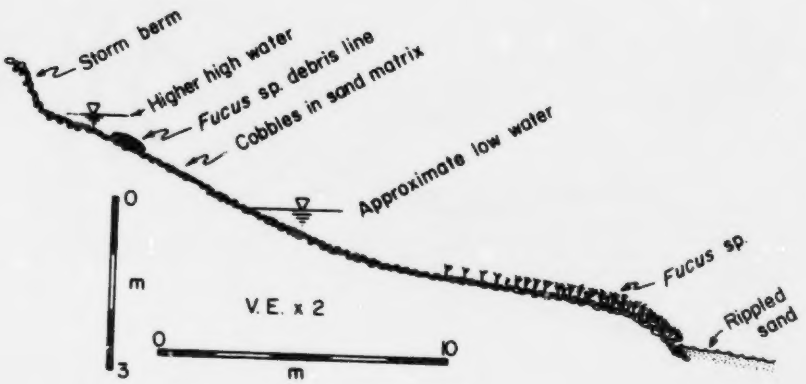

FIGURE 4. Profile across the beach at site 2.

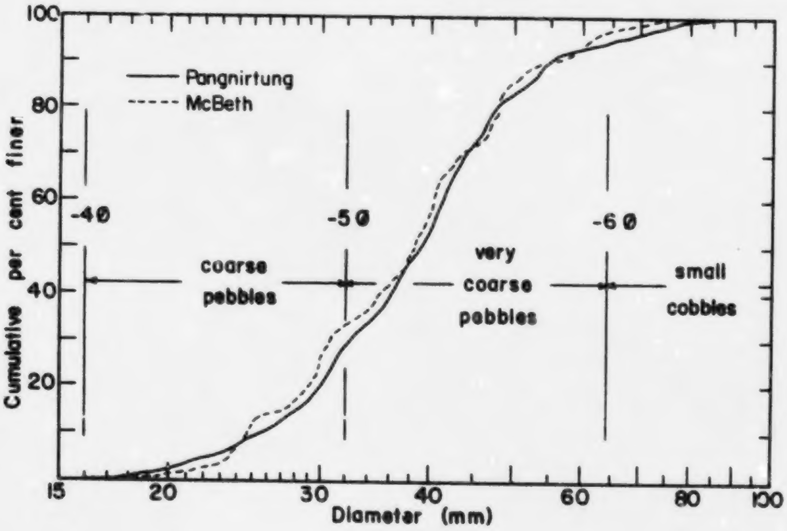

FIGURE 5. Cumulative frequency distribution of stones attached to fucoid algae at Pangnirtung Fiord (Gilbert, 1984) and McBeth Fiord. The equivalent spherical diameter is determined from the weight of the stone assuming a density of 2.70 g/mL.

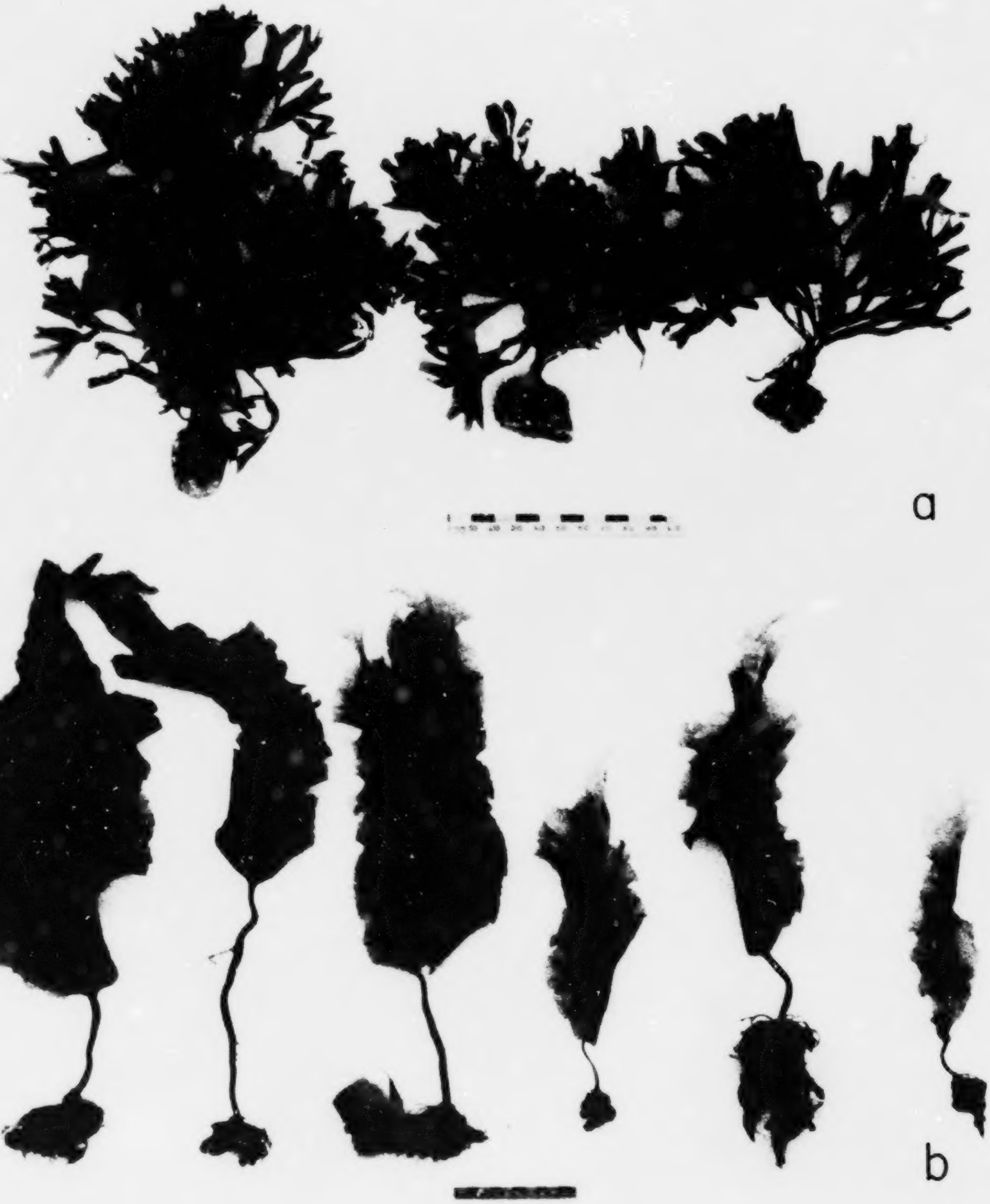

FIGURE 6. Representative specimens of algae with attached sediment particles: (a) Fucus sp. and (b) Laminaria sp. Scale is in centimetres.

COARSE PARTICLES IN THE SEDIMENTS OF CAMBRIDGE, MCBETH AND ITIRBILUNG FIORDS

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This report summarizes the preliminary findings on particles coarser than 2 mm recovered from van Veen grab samples in Cambridge, McBeth and Itirbilung Fiords. The results are compared with observations from UMEL bottom photographs and with cores from the same area.

BACKGROUND

Sediments from the Baffin Island Fiords are made up largely of fine flocculated silt and clays with layers of varying thickness of clean well sorted sand (see for example, Gilbert et al., this volume, Chapter 14). The latter are ascribed to several types of gravity flows from deltas, fans, fiord walls and nearshore areas. Mixed with these sediments are coarse particles ranging from coarse sand to cobbles and boulders. Table 1 is a list of the processes by which these particles may reach the fiord floor. The information is inferential as none of these processes has been observed, although there are numerous acounts of conditions necessary for their occurrence. These include the movement and floating of stones by algae (Gilbert, 1984; Chapter 8 this volume), sediment laiden icebergs and sea ice (among others, Kindle, 1924; Campbell and Colin, 1958; Ovenshine, 1970; Hoskin and Valencia, 1976; Elverhoi and Roaldset, 1983), the freezing of sediments in nearshore sea ice (Rosen, 1979; Gilbert, 1984), the overrun of river water and sediments especially from nival floods before sea ice breakup (Knight, 1971; Remnitz and Bruder, 1972; Keys, 1978), and of avalanches and slides (Luckman, 1975). Observations by Kindle (1924, p. 257) and Fuchs and Whittard (1930, p. 425) indicate that wind may also move particles up to cobble size onto sea ice.

In the lower section of Table 1 a qualitative assessment has been made of the possible relative importance of each of the processes. In the terminology of Thomas and Connell (in press) "drops" refer to single particles and "dumps" to a cascade of many particles at once. Where sediments are frozen into ice (as opposed to resting on the surface), it is possible that sediment-laiden ice blocks may sink to the bottom if they break from clearer ice or if the clearer ice is melted. As little as 17% sediment by volume (with density = 2.70 g/mL) is required to sink ice in salt water. Once on the bottom, the ice will melt slowly releasing a packet of sediment which might be recognised by its limited areal extent (several square metres), loading on soft sediments beneath, and absence of sorting or grading.

TECHNIQUE

Except for small vials of sediment, the sediments recovered in the van Veen grab sampler were wet sieved at 2 mm. Sediments recovered on the sieve were dryed aboard ship. In the laboratory they were dry sieved at 0.5 Ø intervals, weighed and counted (Table 2). Summary statistics are presented in Table 3. Roundness determined for particles coarser than 8 mm (where there were more than 20 in the sample) and the middle roundness number (M.R.) calculated according to Olsen (1983). Data are presented in (Table 4). The mineralogy of these particles was assessed visually (Table 5).

The UMEL bottom photographs were examined to determine those in which drop stones appear, and selected photographs were measured in more detail to determine the number of stones and the per cent of the bottom covered (Table 6). The latter was determined by dot counts of 440 points per photograph, each representing an area of 11 cm^2.

Four cores from Cambridge and Itirbilung Fiords are available (see Gilbert et al., Chapter 14 this volume). The sizes of all particles coarser than 2 mm visible in the x-radiographs of these cores were recorded (based on the projections onto the x-radiographs of the largest and second largest axes) and are presented in Table 7.

The locations of all sampling sites are shown in Fig. 1.

DISCUSSION

The van Veen recovers sediment from an area 37 x 37 cm. The depth of penetration, and therefore the amount of material sampled depends in part on the hardness of the bottom. The volume of sediment from which stones were sieved varied from 3.0 to 10.4 L. The data in Table 2 are presented in Figs. 2 and 3 in terms of the weight and number of stones per litre of sediment. This correction does not completely remove the bias of different sample volumes, because at some sites (on the sills, for example) the stones may have been concentrated at the surface by winnowing to produce an armoured surface. Small samples from these locations will overestimate the occurrence of stones as compared to a larger sample from deeper into the sediment. As well, the grab sampler is unable to recover the larger stones which may be present. The largest stone recovered is 112 by 77 mm diameter (a and b axes); the largest stones in the UMEL photographs are about 480 x 203 mm (CS57), 376 x 220 mm (CS58), and 280 x 200 mm (CS154). Several larger stones were only partly photographed. For this reason and because the lower limit is arbitrarily set at 2mm, it is not appropriate to present statistics of average size, variance, etc. for the samples. Finally, the number of samples available even from Cambridge Fiord is insufficient to characterize completely the nature of coarse particles and their distribution.

Nevertheless, some observations can be made from the data.

1. Cambridge Fiord has approximately an order of magnitude more coarse particles per unit volume of sediment than McBeth or Itirbilung, and they are larger on average.

2. Even at sites close together (as CA4.1 and 4.2, Fig. 3) the numbers and sizes of stones are greatly different.

3. The occurrence of stones does not show a strong relation with location in the fiord (Fig. 3) or the depth of water. Since the fall of drop stones and the transport of coarse particles in gravity flows are infrequent and quasi-random processes, this is not unexpected. Nevertheless, the plots of Fig. 3 suggest some trends in the data. The numbers of stones increase rapidly down fiord from the head to about 10 km in Cambridge and about 30 or 40 km in Itirbilung. The weights show a similar pattern in Itirbilung, but in Cambridge there are more larger stones at the head. Since they are highly angular, they are probably not derived from the gravels and cobbles of the large raised delta at the west end of the fiord.

The more rapid deposition near the heads of the fiords from the turbid inflow is probably the cause of the trends. If the rate of emplacement of coarse stones is approximately the same everywhere, the trends suggest rates of deposition in upper Itirbilung Fiord greater by an order of magnitude than in Cambridge Fiord, and that the effect extends considerably farther downfiord in Itirbilung Fiord.

4. Stones recovered from the sill in Cambridge Fiord are not significantly more abundant or larger than at several other locations in the fiord. The UMEL photographs, on the other hand, show a very significant concentration of stones on the sill where up to more than 95% of the surface is comprised of stones as compared to less than 10% elsewhere (Table 6 and Fig. 4). Even on the sill, however, the composition of the surficial sediments varies greatly.

5. The stones larger than 8 mm are mainly angular (Table 4) with middle roundness numbers in the range 1.44 to 1.95. Olsen (1983, Fig. 2) classifies sediments as follows:

M.R. < 1.5: materials from landslides, mudflows or weathering processes,
$1.5 <$ M.R. < 2.67: materials from tills,
M.R. > 2.67: glaciofluvial and strandline (beach) material.

Of the total number of particles, only 10.1% are rounded and 0.58% well rounded. If it is assumed that most of the angular and subangular particles are of glacial (droped from icebergs) or colluvial origin, and most of the rounded and well rounded particles are from rivers, fans and beaches, then the dominance of the former agents is apparent. There is no obvious downfiord change in roundness (Fig. 5).

6. The mineralogic composition of the stones suggests a local origin. The bedrock in the area of Cambridge Fiord is comprised largely of Archean and Aphebian granitoid and granodioritic migmatite with lesser amounts of quartz monzonites especially in a small area 5 km from the head of the fiord (Jackson et al., 1975). As this is characteristic of the entire area, and as the mineralogic composition of individual units is so varied, it is probably not possible to establish the exact provenance of most particles. However, there is an area in the northeast portion of the drainage basin of Cambridge Fiord including part of Livingstone Island in Buchan Gulf and the peninsula between Cambridge Fiord and Drever Arm which is comprised of the Mary River Group of metasedimentary and metavolcanic rocks. These apparently partially underlie at least two of the glaciers which calve into northeastern Cambridge Fiord. The composition especially of samples CA2.2GS, CA4.1GS and CASILL3 GS 4 and 5 (Table 5) may reflect dumps from bergs calved from these glaciers. Diabase and gabbro in CASILL3

GS 4 and 5 and CA6.1 may also be of local origin from the Hadrynian Franklin intrusions. These dykes are common especially in the area around Buchan Gulf.

In only 2 samples, IT5 and 6 GS, were there any Phanerozoic sedimentary rocks. Both these stations are in northern Home Bay, beyond the mouth of the fiord. One of the particles from IT5GS is an almost perfectly rounded limestone pebble which was probably transported by sea ice from a beach in Lancaster Sound or the area to the north or west. Limestone fragments are common in the sediments of western Baffin Bay (Marlowe, 1966) and in the raised marine deposits of the outermost coast of Baffin Island (Andrews and Miller, 1979), but apparently are not transported into the fiords by either sea ice or icebergs.

7. Particles coarser than 2 mm are also abundant in piston cores from Cambridge Fiord, especially CA3.0 (Table 7). With a few exceptions most stones occur in silts and clays rather than in the sand layers of the cores. This indicates that they are drop stones rather than products of gravity flows. Most occur singly (Fig. 6c and d), although others appear to be part of small dumps (Fig. 6b). There are accumulations of small stones at the tops of several cores, especially CA3.0 (Fig. 6a). The fine sediments near the stones show little disturbance as a result of the impact. This is seen clearly in Fig. 6c where sediments are only slightly bowed down beneath and beside the stone at 327 cm depth. There also appears to be little effect of post depositional compaction in the fine sediments. It is estimated that this particle would have had a terminal fall velocity of about 60 cm/s (Ruby 1933) and a kinetic energy of 0.003 J at impact. The question of the effect of drop stones on sediments and the role of the geotechnical properties of fine sediments is one worthy of further study. Several of the coarse particles occur in the massive sands ascribed to gravity flow events. The most striking is a large, very angular, fractured, small cobble of granodiorite which occurs 0.16 m below the top of a 1.77 m thick, massive, well sorted sand layer in CA1.6. The particle appears to be of glacial or colluvial origin and has been transported within what was probably a major debris flow (see Gilbert, 1984, Fig. 5). Small pebbles are also associated with minor sand layers (as at 318 cm in CA3.0 (Fig. 6c).

8. Some stones, especially those recovered from the sill in Cambridge Fiord show the effect of long exposure in an environment where almost no fine sediment is being

deposited. The bottom portions of the stones which were buried in fine sediments are unaltered, whereas the tops above a prominent line marking the sediment surface are encrusted with calcareous algae and other organisms over more than half of their surfaces. This environment may also be seen in some of the bottom photographs (Fig. 4b).

CONCLUSION

Coarse particles, most of which are drop stones from icebergs of local origin, are an important constituent of the sediments of at least some of the fiords of eastern Baffin Island. They may be useful indicators of rates of sedimentation, currents and circulation, the geotechnical properties of the sediments, and Holocene glacial environments.

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TABLE 1: SOURCES OF COARSE PARTICLES IN THE FIORD SEDIMENTS

	Mass movement		Drop Stones							
	Initially subareal slides & slumps	Subaqueous slides, slumps & gravity flows from shallow water	Algal rafting	Ice rafting						
				Ice bergs	Sea ice					Aeolian sediment
					Shore material		Overrun			
					beaches	inter-tidal flats & shallow water	rivers	dirty avalanches	mass movement	
Drops	a	A & r	r	A	R	R	R	a	A	r
Dumps	A	A & r		A	r	r	R	a	A	r
frozen aggregates				A	r	r	R*			

A indicates predominantly angular particles, R predominantly rounded particles.
Upper case indicates a potentially significant source, lower case a minor source.
* only where subsequent freezing by the overflowing river occurs.

TABLE 2. WEIGHT AND NUMBER OF STONES RECOVERED FROM GRAB SAMPLES

					Size classes (mm)							
64	45	32	23	16	11	8	5.66	4	2.83	2	Sample volume before wet sieving (L)	Sample No.
			------ ------	weights numbers	------ ------							
			102.35 3	14.91 2	90.4 2	8.50 7	1.18 3	0.11 1	0.12 2		4.5	CA0.2GS
	205.70 1		124.43 4	47.90 5	56.30 16	45.23 34	28.53 63	22.25 139	14.16 250	5.62 195	7.8	CA0.3GS
	109.45 1	247.77 1	128.66 4	56.83 7	10.69 3	25.13 18	12.33 23	5.77 32	4.92 85	1.28 48	9.0	CA1.0GS
	354.08 2	162.45 2	134.77 4	80.56 9	50.72 18	51.37 36	37.66 76	18.45 104	7.50 117	1.06 44	9.0	CA1.2GS
		144.26 2	90.75 3	33.03 5	27.70 7	24.76 21	24.83 54	19.61 127	20.73 376	6.74 242	9.0	CA1.3GS
		61.52 1	23.88 1	56.04 6	45.56 15	32.10 27	38.28 79	25.63 163	23.45 405	6.87 244	6.4	CA1.4GS
429.1 1			56.77 2	34.54 5	29.11 10	41.46 31	30.37 63	20.94 120	15.79 313	7.80 310	7.9	CA1.5GS
658.7 1	140.91 1	222.26 3	137.53 4	88.07 7	63.46 17	38.05 31	41.54 90	28.30 190	28.14 375	11.04 415	8.0	CA1.7GS
			19.30 1	75.08 6	11.60 4	24.51 17	7.52 18	8.23 54	1.53 22	0.08 4	3.0	CA2.2GS
			88.07 3	26.63 2	109.50 31	79.44 66	81.39 177	73.68 410	45.71 716	13.19 448	9.0	CA4.1GS
						3.15 2		0.87 7	0.24 5		4.5	CA4.2GS
				55.87 5	32.35 10	30.88 24	31.01 58	24.09 151	21.72 374	7.62 280	9.0	CA4.3GS
				27.56 3	44.87 14	18.01 15	14.46 30	10.63 70	6.73 115	2.50 90	9.0	CA6.1GS
			16.10 1	22.39 3	17.35 5	17.45 14	12.00 29	7.79 46	5.21 80	0.76 27	9.0	CA7.1GS
1307. 1			19.74 1	18.76 2	61.55 16	25.17 19	26.80 57	14.10 86	10.38 185	2.70 103	10.0	CAS1113GS1
937.7 1	713.42 3	239.54 2	211.98 7	130.18 13	85.82 22	55.26 41	55.65 120	47.84 305	39.80 672	13.98 518	10.4	CAS1113GS2

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                    134.73    23.46    14.16    49.12    28.63    28.98    19.88    18.14     6.07  5.2      CAS1113GS3
                    2         1        2        14       23       65       119      315      233
          202.60    131.72    54.00    24.78    67.83    50.33    33.87    26.14    25.38     7.74  3.0      CAS1113GS4
          1         1         2        4        19       41       69       158      443      306
          470.49              144.43   140.64   63.11    55.30    59.28    53.49    46.67    11.44  6.25     CAS1113GS5
          2                   4        15       19       44       124      316      779      407
                                                                                                  3.6      IT0.1GS
                                                 0.33     0.65     0.14                           8.8      IT0.3GS
                                                 1        6        3
                                                                            0.27     0.23     0.03  6.9      IT0.4GS
                                                                            1        6        1
                                                          1.20     2.68     2.47     1.55     0.57  9.2      IT1.1GS
                                                          1        9        15       31       28
                              21.59              4.13     2.33     2.08     2.37     1.18     0.20  10.1     IT1.2GS
                              1                  2        2        5        20       26       8
                                                          4.52     0.70     1.25     0.76     0.18  8.4      IT2.1GS
                                                          2        2        9        14       8
                                        8.80     9.44     6.50     2.87     1.68     0.52     0.03  8.9      IT2.2GS
                                        1        2        4        7        15       8        1
                                        14.51             7.27     4.05     4.18     2.30     0.50  9.7      IT2.3GS
                                        2                 7        9        26       39       21
          228.84    70.37     39.04     14.94    21.38    2.09     4.64     4.18     1.73     0.65  4.7      IT3.1GS
          1         1         2         2        5        2        11       26       31       29
1049.     640.78    217.78    165.30    61.85    31.03    24.29    15.26    12.39    6.46     0.33  9.0      IT5GS
1         2         2         6         5        7        18       32       68       89       13
                    65.60                                          0.77     0.20     0.03     0.02  4.3      IT6GS
                    1                                              1        1        1        1
                                        25.00    4.61     8.51     6.51     4.40     3.00     0.57  9.7      MC0.1GS
                                        2        1        6        16       29       57       24
                                                          4.07     1.77     5.18     2.67     0.70  5.0      MC2.0GS
                                                          3        4        34       44       29
                              20.33                       1.36     0.23     0.92     0.58     0.10  3.94     MC2.1GS
                              1                           1        1        8        1        4
                                                                                                  7.4      MC4.1GS

                                        15.37             4.23     1.09              0.11     0.11  4.6      MC83.6GS
                                        2                 3        2                 2        5
```

TABLE 3: SUMMARY STATISTICS OF DROP STONES

Sample Number	Distance from fiord head (km)	Water depth (m)	No. of stones	No. per litre	Total weight (g)	Weight per litre
CA0.2GS	1.25	125	20	4.4	136.2	30.26
CA0.3GS	3.15	200	710	91.0	604.4	77.49
CA1.0GS	3.20	181	222	24.2	602.8	66.98
CA1.2GS	3.50	190	412	45.9	898.6	99.84
CA1.3GS	5.09	240	837	93.0	392.4	43.60
CA1.4GS	6.20	218	941	147.0	313.3	48.95
CA1.5GS	6.85	262	855	108.2	665.9	84.29
CA1.7GS	9.25	310	1134	141.8	1458.	182.2
CA2.2GS	18.55	292	126	42.0	147.9	49.3
CA4.1GS	35.50	520	1853	205.9	517.6	57.51
CA4.2GS	35.25	513	14	3.1	4.26	0.946
CA4.3GS	44.15	560	902	100.2	203.5	22.61
CA6.1GS	67.80	750	337	37.4	124.8	13.87
CA7.1GS	77.30	660	205	22.7	99.05	110.0
CASILL3-GS1	68.40	397	470	47.0	1487.	148.7
CASILL3-GS2	69.55	327	1704	163.8	2531.	243.4
CASILL3-GS3	67.40	322	774	148.8	323.2	55.72
CASILL3-GS4	69.65	292	1044	348.0	624.4	107.6
CASILL3-GS5	70.65	225	1710	275.8	1045.	180.1
IT0.1GS	.85	55	0	0.	0.	0.
IT0.2GS	2.00	88	2	0.2	0.62	0.068
IT0.3GS	4.85	155	10	1.1	1.12	0.127
IT0.4GS	3.85	148	8	1.1	0.53	0.077
IT1.1GS	10.95	256	84	9.1	8.47	0.920
IT1.2GS	12.90	293	64	6.1	33.88	3.35
IT2.1GS	19.05	310	35	4.1	7.41	0.882
IT2.2GS	23.05	402	38	4.2	29.84	3.35
IT2.3GS	35.02	424	104	10.7	32.81	3.38
IT3.1GS	47.00	356	110	2.3	387.9	82.53
IT5GS	95.00	175	243	27.0	2224.	247.1
IT6GS	115.90	502	5	1.1	66.62	15.49
MC0.1GS	5.03	152	135	13.9	52.60	5.42
MC2.0GS	16.75	320	114	22.8	14.39	2.87
MC2.1GS	25.05	320	26	6.6	23.51	2.61
MC4.1GS	55.13	549	0	0.	0.	0.
MC83.6GS	84.75	439	14	3.0	20.91	4.54

TABLE 4: CLAST ROUNDNESS ACCORDING OLSEN (1983)

Sample number	No. (fraction) of stones coarser than 8 mm								Middle roundness number M.R.*
	Angular		Subangular		Rounded		Well rounded		
CA0.2GS	7	**	5	**	1	**	1	**	**
CA0.3GS	30	(0.476)	30	(0.476)	3	(0.047)	0		1.57
CA1.0GS	14	(0.412)	12	(0.353)	7	(0.206)	1	(0.029)	1.85
CA1.2GS	32	(0.451)	26	(0.366)	13	(0.183)	0		1.73
CA1.3GS	19	(0.500)	14	(0.368)	5	(0.132)	0		1.63
CA1.4GS	22	(0.440)	23	(0.460)	5	(0.100)	0		1.66
CA1.5GS	28	(0.571)	17	(0.347)	4	(0.082)	0		1.51
CA1.7GS	26	(0.406)	26	(0.406)	12	(0.188)	0		1.78
CA2.2GS	13	(0.464)	14	(0.500)	0		1	(0.036)	1.61
CA4.1GS	37	(0.363)	49	(0.480)	16	(0.157)	0		1.79
CA4.2GS	1	**	1	**	0		0		**
CA4.3GS	20	(0.513)	12	(0.308)	7	(0.179)	0		1.88
CA6.1GS	18	(0.563)	13	(0.406)	1	(0.031)	0		1.47
CA7.1GS	13	(0.565)	9	(0.391)	1	(0.043)	0		1.48
CASILL3-GS1	19	(0.500)	17	(0.447)	2	(0.053)	0		1.55
CASILL3-GS2	45	(0.506)	36	(0.404)	8	(0.090)	0		1.58
CASILL3-GS3	21	(0.500)	19	(0.452)	2	(0.048)	0		1.55
CASILL3-GS4	36	(0.529)	30	(0.441)	2	(0.029)	0		1.50
CASILL3-GS5	49	(0.583)	31	(0.369)	4	(0.048)	0		1.46
IT0.1GS	0		0		0		0		**
IT0.2GS	0		0		0		0		**
IT0.3GS	7	**	0		0		0		**
IT0.4GS	0		0		0		0		**
IT1.1GS	1	**	0		0		0		**
IT1.2GS	3	**	2	**	0		0		**
IT2.1GS	2	**	0		0		0		**
IT2.2GS	5	**	1	**	1	**	0		**
IT2.3GS	6	**	3	**	0		0		**
IT3.1GS	7	**	4	**	1	**	1	**	**
IT5GS	15	(0.366)	14	(0.341)	10	(0.244)	2	(0.049)	1.98
IT6GS	0		1	**	0		0		**
MC0.1GS	4	**	4	**	1	**	0		**
MC2.0GS	2	**	1	**	0		0		**
MC2.1GS	0		1	**	1	**	0		**
MC4.1GS	0		0		0		0		**
MC83.6GS	1	**	2	**	2	**	0		**
Total	513		417		99		6		

* M.R. = (fraction of angular particles) + 2x(fraction of subangular particles) + 3x(fraction of rounded particles) + 4x(fraction of well rounded particles). 1 < M.R. < 4

** fewer than 20 particles in the sample

TABLE 5: MINEROLOGIC COMPOSITION OF DROP STONES (% BY WEIGHT)

Sample Number	Precambrian													Phaner-ozoic
	Gr	Grd	Mo	Sy	Di	MS	Db	Mv	Q	Ga	KF	Oth	Uk	
CA0.2GS	60	35	-	-	5	-	*	-	-	-	-	-	-	-
CA0.3GS	30	60	-	-	-	10	-	-	-	-	-	*AG	-	-
CA1.0GS	70	20	5	-	5	-	-	-	-	-	-	-	-	-
CA1.2GS	60	30	-	-	10	-	-	-	-	-	-	-	-	-
CA1.3GS	60	40	-	-	-	-	-	-	-	-	-	-	-	-
CA1.4GS	70	30	-	-	*	*	-	-	-	-	-	-	-	-
CA1.5GS	55	25	-	10	10	-	-	-	-	-	-	-	-	-
CA1.7GS	40	40	-	5	10	-	5	-	-	-	-	-	-	-
CA2.2GS	30	30	20	-	-	20	-	-	-	-	-	-	-	-
CA4.1GS	20	20	20	-	*	*	-	40	-	-	-	-	-	-
CA4.2GS	50	50	-	-	-	-	-	-	-	-	-	-	-	-
CA4.3GS	55	35	-	5	5	*	-	*	-	-	-	-	-	-
CA6.1GS	50	20	-	10	10	-	10	-	-	-	-	-	-	-
CA7.1GS	20	10	20	-	-	-	-	-	10	30	-	10B	-	-
CASILL3-GS1	50	5	-	40	5	-	-	-	-	-	-	-	-	-
CASILL3-GS2	75:	15	*	*	-	-	-	-	-	-	5	-	-	-
CASILL3-GS3	45	25	10	10	10	-	-	-	*	-	-	-	-	-
CASILL3-GS4	50	20	-	10	-	5	5	-	10	-	-	-	-	-
CASILL3-GS5	30	20	10	-	10	10	-	-	-	20	-	-	-	-
IT0.1GS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT0.2GS	100	-	-	-	-	-	-	-	-	-	-	-	-	-
IT0.3GS	100	-	-	-	-	-	-	-	-	-	-	-	-	-
IT0.4GS	70	25	-	-	-	5	-	-	-	-	-	-	-	-
IT1.1GS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT1.2GS	80	20	-	-	-	-	-	-	-	-	-	-	-	-
IT2.1GS	60	40	-	-	-	-	-	-	-	-	-	-	-	-
IT2.2GS	80	-	-	-	-	20	-	-	-	-	-	-	-	-
IT2.3GS	50	30	-	-	20	-	-	-	-	-	5	*G,A	-	-
IT3.1GS	55	20	-	-	-	-	5	-	-	-	-	*P	20	-
IT5GS	40	-	-	-	-	-	10	-	10	-	-	-	30	5M,5D
IT6GS	80	-	-	-	-	-	-	-	-	-	-	-	-	20L
MC0.1GS	35	30	-	-	-	-	35	-	-	-	-	-	*	-
MC2.0GS	40	30	*	-	-	-	*	5	10	-	-	-	15	-
MC4.1GS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MC83.6GS	50	-	-	-	50	-	-	-	*	-	-	-	-	-

Key

* present in small amounts

Gr	granite	Di	Diorite	Q	Quartz	Oth	others
Grd	granodiroite	MS	Mica Schist	Ga	Gabbro	Uk	unknown
Mo	Monzonite	Db	Diabase	KF	Potassium Feldspar		
Sy	Syenite	Mv	Metavolcanics				

AG	augen gneiss	A	Albite	M	Mudstone
B	Basalt	G	Garnet	D	Dolostone
P	Pyrite			L	Limestone

TABLE 6: DROPSTONE OBSERVATIONS FROM UMEL PHOTOGRAPHS

Station Number	Depth (m)	No. of photos *	No. (%) showing stones*	Photo Number	No./m^2	% area stone covered
CA0.2	108	13	8 (61)	CS23	4	2.7
				CS28	8	8.8
				CS34	12	6.1
CA1.0	182	10	3 (33)	CS76	4	3.6
				CS79	4	1.8
				CS81	4	1.8
CA1.1	183	20	6 (33)	CS122	2	7.5
CA1.2	194	14	7 (50)	CS85	6	7.5
				CS93	4	2.9
				CS96	6	1.7
				CS97	6	2.8
CA3	365	10	5 (50)	CS150	8	3.2
CA4.1	515	16	6 (38)	CS39	4	.9
				CS40	2	.9
				CS41	4	3.1
CA6.1	750	18	1 (6)	CS10	2	2.7
CA6	665	20	0	CS141	0	0
CASILL1		20	19 (95)	CS51	14	4.8
				CS56	6	1.9
				CS57	8	13.3
				CS58	16	11.8
				CS62	88	47.6
				CS64	111	5.6
				CS65	1317	96.6
				CS66	3210	95.2
				CS70	10	4.9
CASILL3	190-402	16	10 (62)	CS154	12	12.0
				CS155	4	21.6
				CS158	8	.3
IT0.1	72	19	0	CS264	0	0
IT0.2	88	18	0	CS1935	0	0
IT0.3	155	20	0	CS288	0	0
IT0.4	140	22	1 (5)	CS221	4	.1
IT1.1	256	18	1 (6)	CS168	2	.1
IT1.2	283	10	0	CS282	0	0
IT2.1	288	20	2 (10)			
IT2.3	424	20	0			
IT TR1	274	16	1 (6)			
IT TR2	126	18	1 (6)			
MC0.1	150	20	1 (5)	CS377	2	.1
MC2.1	320	20	1 (5)			
MC4.1	549	20	0			
MC TR1	168	18	3 (17)	CS417	2	.1
				CS432	4	6.7

* Data provided by G.E. Farrow.

TABLE 7: PARTICLES COARSER THAN 2 MM IN SELECTED CORES

Core No.	Depth below surface cm	Diameter (mm) of		Surrounding material
		large axis	small axis	
CA1.6	0.4	4	2.5	Disturbed silt
	1.7	7	4	" "
	2.0	8	6	" "
	2.0	5	3	" "
	6.5	3.5	3	" "
	72.0	5	4.5	Structureless clay
	77.0	4	3	" "
	100.2	3	2.5	" "
	110.3	5	3	" "
	280.5	10	4	Silty clay
	403	83	64	(x 39 mm) in massive sand from 387 - 564 cm. highly angular granodiorite
CA2.2	6.5	6	3	Grey clay
	8.6	3	1.5	" "
	86.0	2	1.5	Clay
	86.5	2	2	"
	87.0	4	3	"
	90.5	4	4	"
	93.0	8.5	5	"
	97.0	4	3	"
	97.6	5	4	"
	98.0	5	4	"
	100.0	8	4	"
	100.0	18	6	"
	104.0	24	23	"
	111.0	6	3	"
	170.5	18	14	"
	173.0	18	6	"
	187.5	12	7	"
	194.7	6	5	"
	203.2	18	8	In 0.5 cm band of coarse sand
	229.9	11	8	Very coarse sand 227-236 cm
	237.7	6	5	Clay
	246.2	18	8	Clay with sand partings
	261.4	3	1.5	"
	239.5	7	4	In middle of 1 cm band coarse sand
	464.5	4	1.5	Fine sand and silt
	465.5	5	4	"
	466.5	7	6	"
	474.5	21	16	"
	477.4	4	2	"
	478.5	16	10	"

TABLE 7 Continued

CA3.0	6.0	19	5	Massive clay
	6.0	14	9	"
	6.0	7	6	"
	8.0	12	4	"
	15.5	8	4	"
	17.3	3	2.5	"
	57.0	4	3	"
	61.0	3	1.5	"
	69.3	5	4	"
	70.8	3	2	"
	78.3	7	5	"
	105.5	50	24	"
	150.4	3	3	Silty clay
	150.4	3	2	"
	160.5	4	3	"
	169.0	4	3	"
	174.5	6	4	"
	177.8	2.5	2	"
	205.5	3.5	2.5	"
	229.5	4	3	"
	237.1	3	1	Silty sand, some banding
	242.2	11	6	"
	242.5	13	9	"
	243.5	18	17	"
	247.0	3	1.5	"
	265.3	10	5	"
	266.0	15	10	"
	266.8	16	14	"
	297.5	4	2	"
	299.3	14	9	"
	310.8	4	2	"
	318.1	9	5	"
	318.8	4	2	Sand layer 5 mm thick
	318.8	4	2	"
	319.8	6	4	Silty sand, some banding
	328.0	30	23	"
	353.1	8	4	Finely laminated clay
	386.7	3	2	Uniform grey clay
	398.5	41	34	"
	402.0	3.5	2	"
	413.3	2	1.5	"
	419.0	3	2.5	"
	420.0	10	7	"
	438.5	4	2.5	"

TABLE 7 Continued

CA3.0	450.0	4	2	Poorly laminated clay
	509.5	2.5	2.5	"
	514.0	3	2	"
	526.3	9	5	"
	530.0	5	1.5	"
	553.0	6	2	"
	553.0	3.5	1.5	"
	556.0	8	3.5	Silty with some sand grains
	574.0	4	3	"
	581.0	3	1.5	"
	582.0	8	4	"
	590.8	5	2	"
	626.0	5	1.5	"
	643.0	6	4	"
	690.6	7	4.5	"
CA6.0	2.3	6	3	Silty clay
	26.7	5	4	"
	45.4	8	5	"
	57.5	4	2.5	"
	126.0	6	4	"
	135.7	7.5	3	"
	137.4	3	2.5	"
	140.4	5	4	"
	155.0	4.5	3	"
	181.5	3	2	Structureless clay
	194.9	3	2	"
	197.6	6	5	"
	198.0	4	4	"
	198.0	4	2	"
	288.2	3.5	2.5	"
	288.4	3	1.5	"
IT2.1	160.6	3	2	Silt
	162.1	2.5	1	"
	164.6	4	2	"
	174	50	26	"
	193.1	8	4	"
	221.5	8	6	"
	239.0	13	7	"

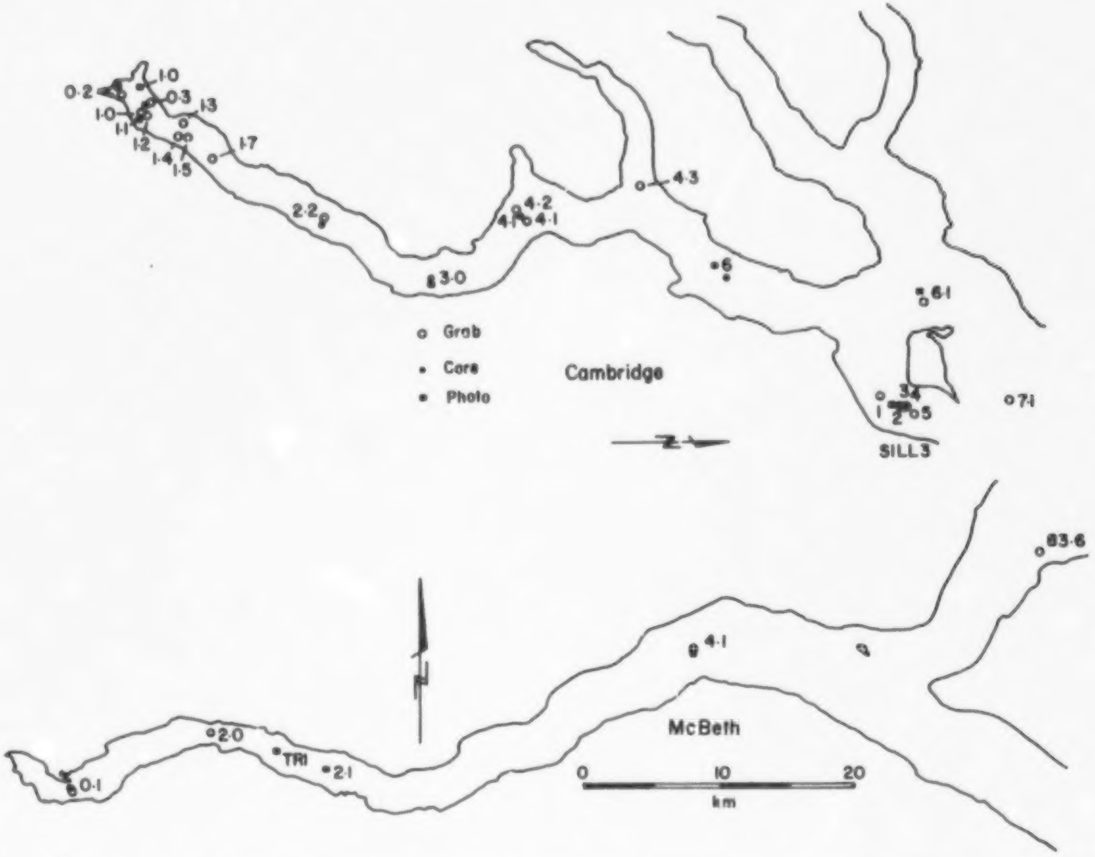
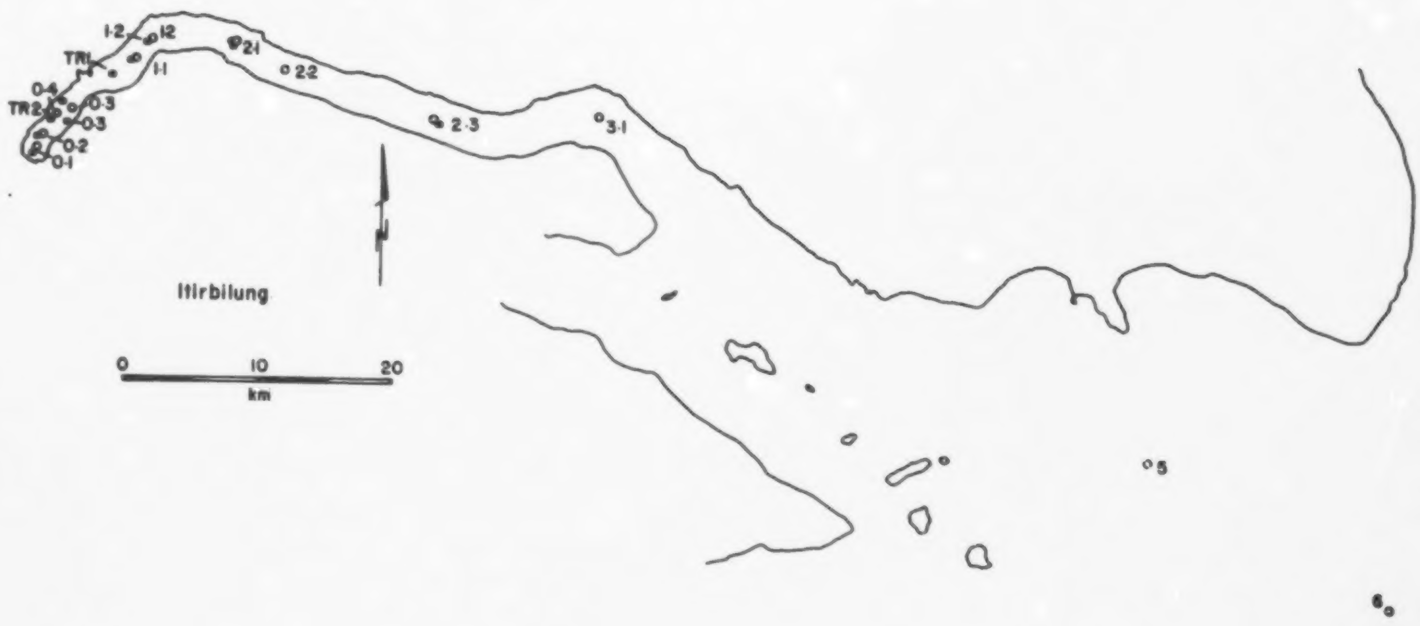


Fig. 1. Maps showing locations of samples discussed in text.


1·2
12
TR1
1·1
2·1
2·2
2·3
3·1
0·4
TR2
0·3
0·3
0·2
0·1
5
6
Itirbilung
0
10
20
km

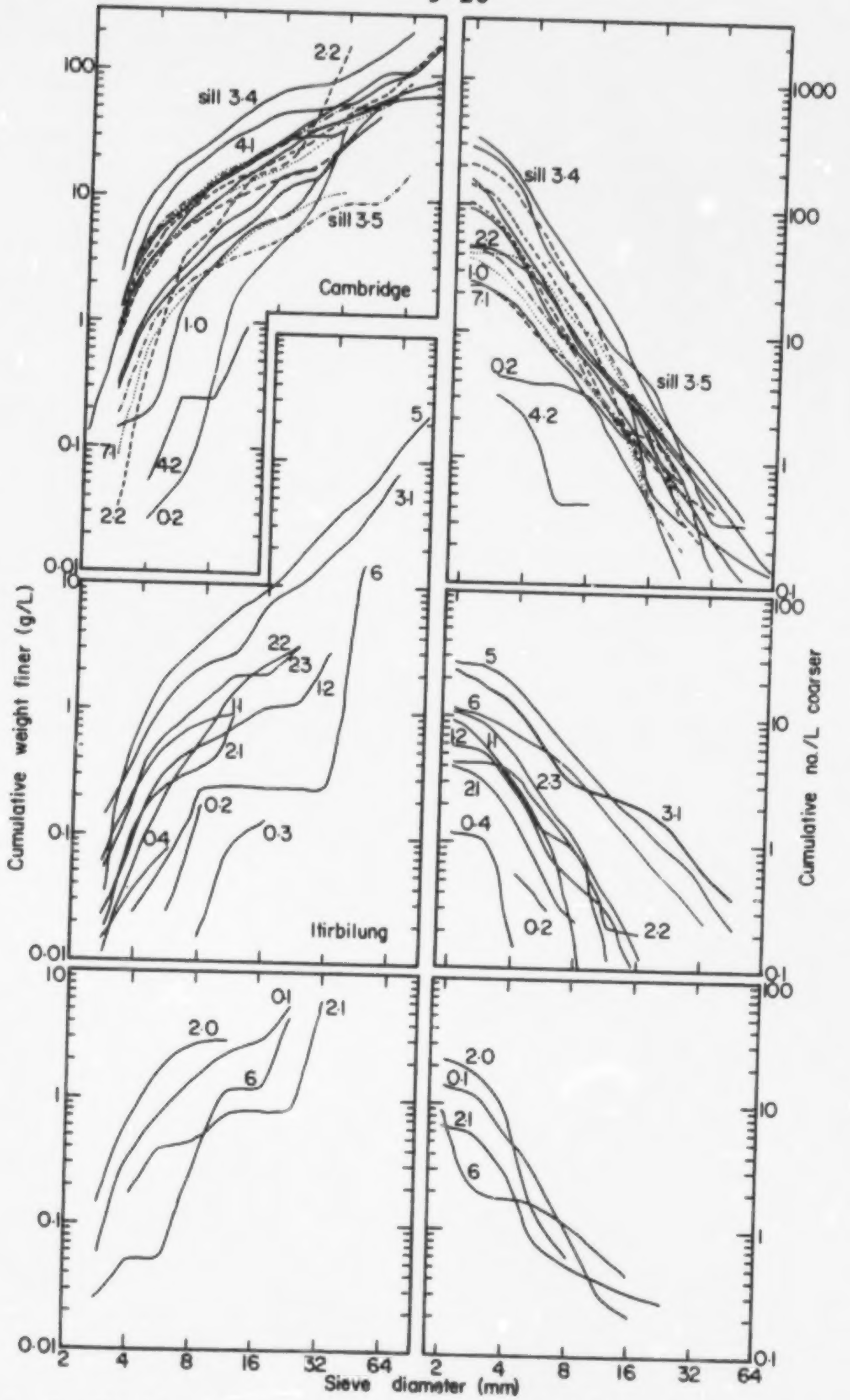


Fig. 2. Numbers and weights per litre of sediment of particles coarser than 2 mm from Cambridge, Itirbilung and McBeth Fiords at 0.5 0 intervals..

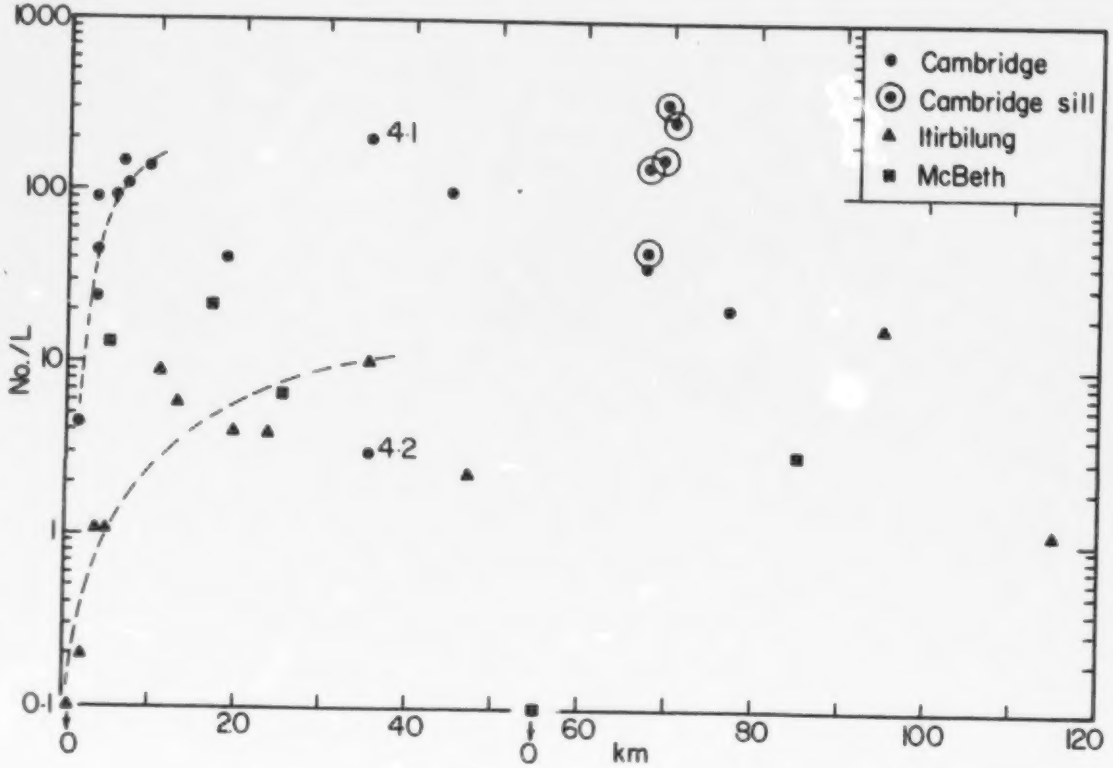
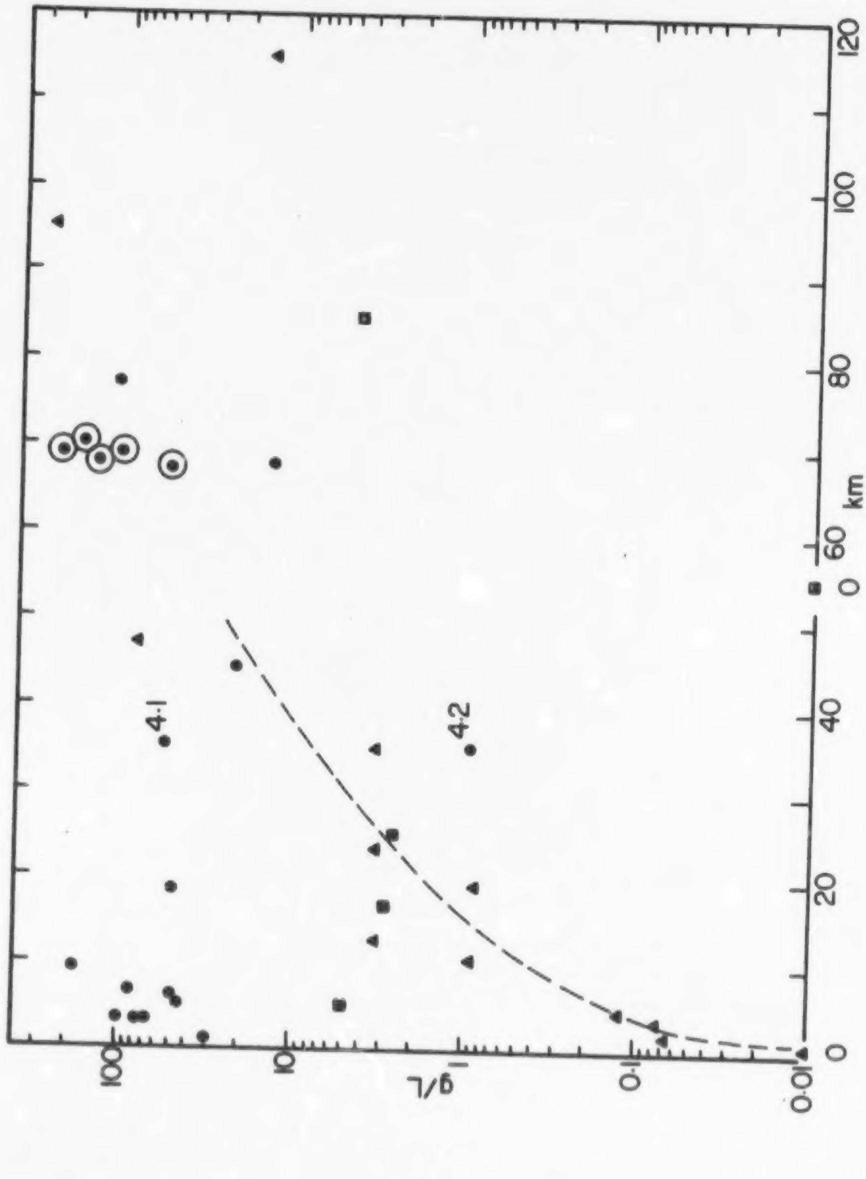


Fig. 3. Total number and weight in g/L of particles coarser than 2 mm in relation to distance from the head of the fiords.


100
10
1
0.1
0.01
g/L
0
20
40
60 km
80
100
120
4.1
4.2

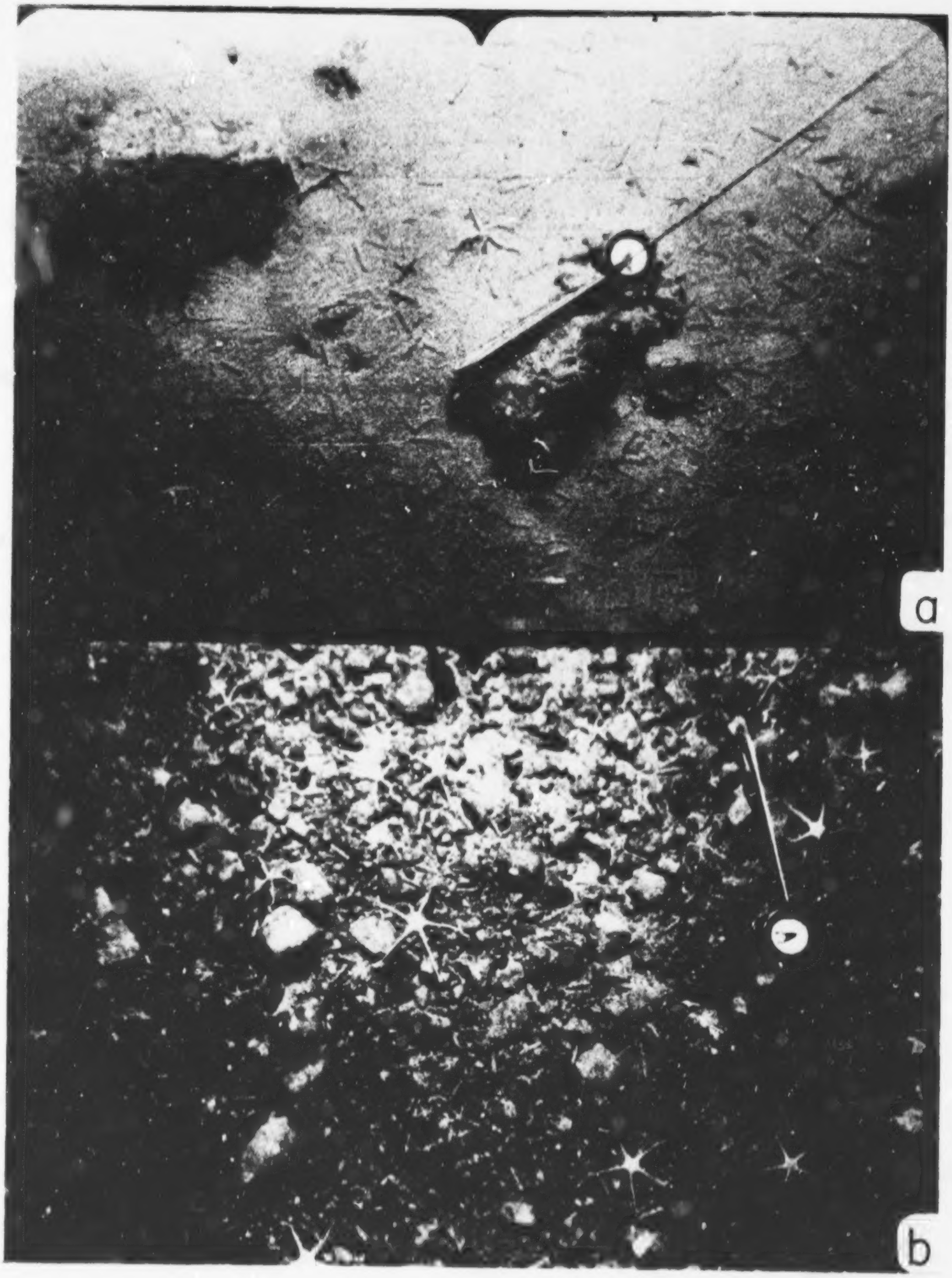


Fig. 4. UMEL photographs (a) CS34 at site CAO.2 and (b) CS65 at CASill 1. Length of the fin on the trigger weight is 16.0 cm.

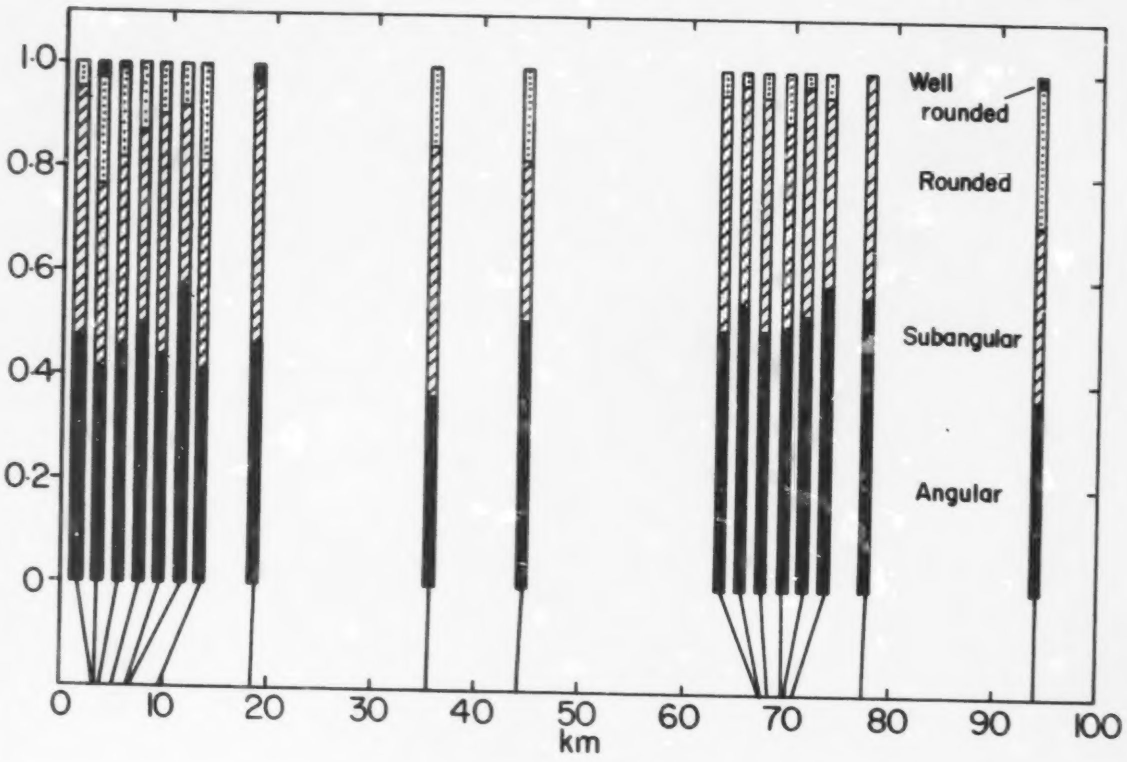


Fig. 5. Clast roundness of particles coarser than 8 mm for samples with 20 particles or more.

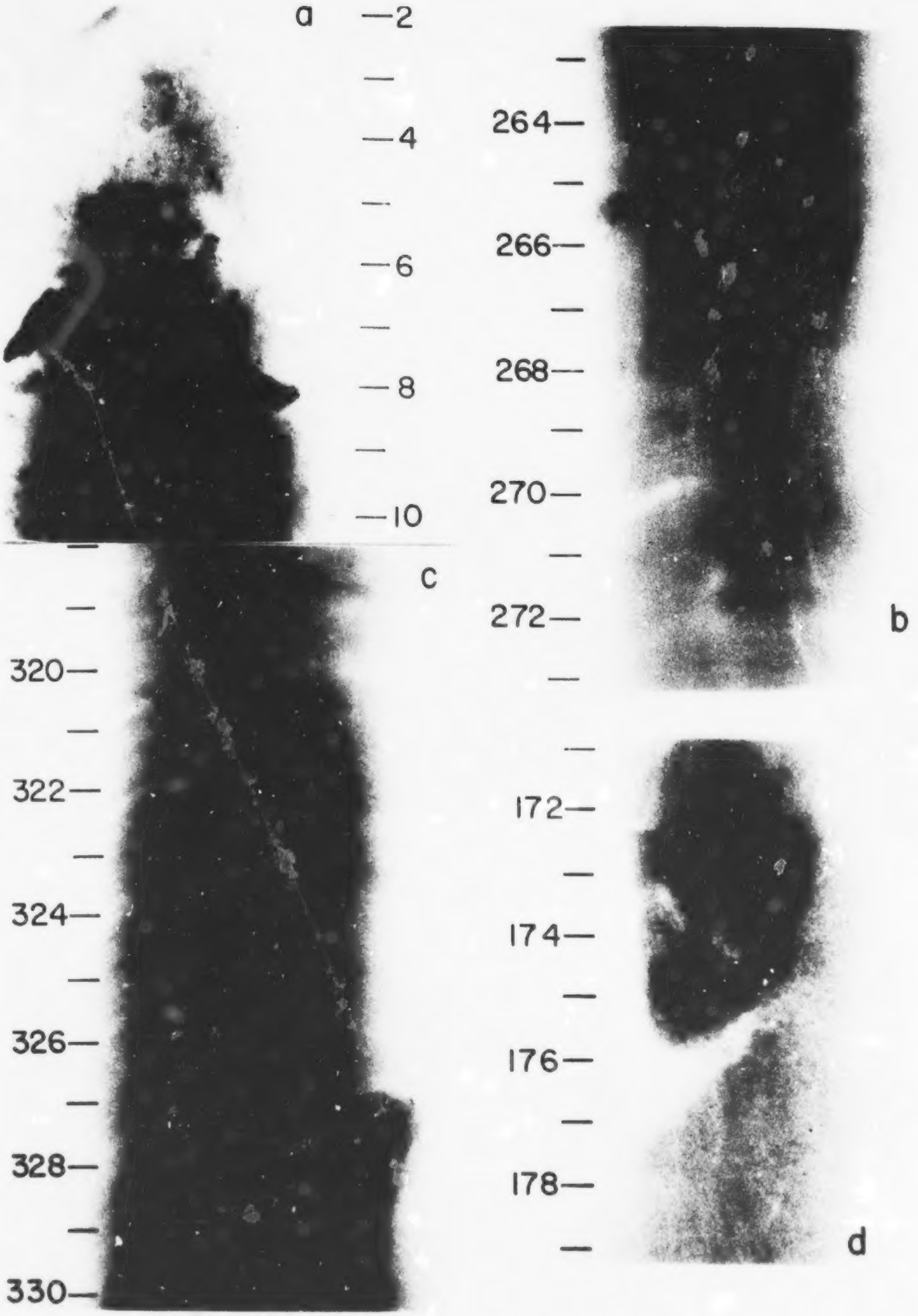


Fig. 6. X-radiographs of sections of core CA3.0 (a, b, and c) and IT2.1 (d). Scale is in cm below the surface.

GEOCHEMICAL DATA FOR MARINE SEDIMENTS FROM EASTERN BAFFIN ISLAND INCLUDING CAMBRIDGE FJORD, ITIRBILUNG FJORD, AND MCBETH FJORD

(LEHIGH CORES)

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INTRODUCTION

This report includes geochemical data that were compiled from sediment subsamples of LeHigh cores collected from three fjords situated along the east coast of Baffin Island. These included Cambridge Fjord (6 cores), Itirbilung Fjord (7 cores) and McBeth Fjord (5 cores) respectively. Sediment analyses included total metals (Fe, Mn, Ca, Mg, Si, Al, Zn, Cu, Ni), weak acid leachable metals (Fe, Mn, Zn, Cu, Ni), the reducible fraction of metals (Fe, Mn, Zn, Cu, Ni), organic carbon, total carbon and moisture content. Pore water analyses included shipboard measurement of free hydrogen ion (pH), free electrons (pE) and dissolved sulfide (pS).

ANALYTICAL METHODS

A. Shipboard

LeHigh gravity cores were collected from sub-bottom depth up to 2.5 metres and were subsequently split lengthwise into working and archive sections. Both sections were immediately covered with thin plastic film in order to control oxidation and avoid moisture loss of the exposed sediments. The working section of each core was visually examined and colour-logged noting HUE, VALUE, and CHROMA using "Munsell Soil Colour Charts", followed by photography. (Included in Geotechnical section - Chapter 11). Electrochemical determinations and subsampling were carried out at 5cm intervals to 100cm; 10cm intervals from 100cm to the bottom of most cores.

pH. A combination Ross^R electrode was standardized against an appropriate series of NBS certified buffers (6.86, 7.00, 7.41, 8.02). Careful placement of the electrode into the sediment was important in order to exclude gas pockets. Reproducibility of ± 0.02 pH units was achieved within one minute.

pE. Redox potential was measured simultaneously using a platinum foil/double junction reference half-cell standardized in Zobell Solutions (Zobell, 1946). The electrodes were carefully inserted to avoid gas pockets. Voltages were recorded at 10s intervals over 90s. Redox potential was calculated from Eh voltages relative to the standard hydrogen electrode. Precision was ± 0.2 pE units.

pS. Total dissolved sulphide as H_2S, HS^- and S^{2-} was determined on 5mL portions of wet sediment which had been spiked with anti-oxidant buffer (Frank and Ross, 1970) and homogenized with a vortex mixer. The buffer serves to raise the pH of the sediment slurry to 13.2, converting, H_2S, HS^- to free sulphide S^{2-}, as well as preventing oxidation of measured species and adjusts the total ionic strength of the solution. A silver/sulfide specific ion electrode coupled to a double junction reference half-cell was placed in the sediment slurry and allowed to equilibrate for 30s. Stable drift-free voltage responses were compared to a calibration curve to determine total dissolved sulfide (ORION RESEARCH, 1982). The range of S= standards was 10^{-2} M/L to 10^{-7}m/L. The detection limit was 10^{-}m/L. The detection limit was 10^{-7}m/L or pS=7.0 and the precision was ± 0.2 pS units.

B. Land-based Analyses

Sediment subsamples were stored in sealed containers and returned to BIO laboratories. Water content (reported as WATER in % of wet weight) was determined by weight loss of samples after drying at 60°C for 48 hrs. Total carbon (TC in % dry weight and organic carbon(OC) were determined with a LECO WR-12^{R} total combustion-analyser. Organic carbon content was determined after inorganic carbonate carbon was removed by 1M HCl treatment.

Elemental analyses of LeHigh cores subsamples was determined by flame atomic spectroscopy and non-sequential leach techniques:

(1) Total metal analyses (SiT, AlT, CaT in % of dry weight; MgT, MnT, FeT, ZnT, CuT and NiT in ppm (mg. Kg^{-1}) after a HF-H_3BO_3 total decomposition method (Buckley and Cranston, 1971).

(2) Weak acid leachable metals Fe, Mn, Zn, Cu and Ni were determined by using a 20mL leach solution of 25% v/v acetic acid to a 1.0 gm portion of sediment and allowing the reaction to proceed for 24 hrs as suggested by MacIntosh *et al*, 1976). The leachate was decanted and analyzed directly by aas. The precision and detection limits of this method were as follows:

	Precision (%)	Detection limit (ppm)
Fe	3	0.7
Mn	2	0.6
Zn	2	0.3
Cu	5	0.4
Ni	5	0.4

3. Reducible metals including Fe, Mn, Zn, Cu and Ni were determined by a method described by Chester and Hughes (1967) in which acidified hydroxylamine hydrochloride was used as the reactant solution. Precision and accuracy were as stated in Chester and Hughes (1967). Reducible metal residuals (FeHR, MnHR, ZnHR, CuHR and NiHR in ppm (mg.Kg^{-1}) are determined as the residual when the weak acid leachable concentrations are subtracted from the hydroxylamine elemental concentrations. This residual fraction is considered to be metal that had precipitated when its reduced form came in contact with oxidized sediments. All metal analyses were conducted on a Varian Model 975 PT coupled to a PSC-55 autosampler in the flame mode. Instrumental conditions were as recommended by the manufacturer.

ACKNOWLEDGEMENT

I would like to thank G.V. Winters for helpful suggestions with regards to the presentation of this data.

CAMBRIDGE FJORD - A

STATION	DATE/TIME	LAT	LONG	TAG #	DEPTH(M)	CORE LENGTH
CA0.2	265/0955	711150	750250	8318110	125	95cm
CA1.6	265/1815	711420	745700	8318114	275	140cm
CA2.0	266/0905(82)	711620	745200		316	142cm
CA4.1	264/1750	712550	744570	8318106	515	146cm
CA4.2	264/0500	712720	744840	8318101	475	150cm
CA6.0	266/1350	713550	743840	8318121	665	273cm

ITIRBILUNG FJORD - B

IT0.1	269/0855	651620	691440	8318128	73	230cm
IT0.3	269/1028	651750	691100	8318131	155	140cm
IT0.4	269/1120	691790	691210	8318134	155	140cm
IT1.1	269/1612	692000	690380	8318139	256	150cm
IT2.2	270/1840	691930	685400	8318154	400	225cm
IT2.3	271/1550	691750	682700	8318159	424	240cm
IT3.1	271/2020	691760	681230	8318161	365	270cm

MCBETH FJORD - C

MC0.1	273/1525	693100	695700	8318173	152	220cm
MC2.0	273/1150	693350	694020	8318170	320	240cm
MC2.1	273/0945	693210	692730	8318165	320	245cm
MC4.1	274/1340	693140	695700	8318181	549	240cm
MC7.0	262/0835(82)	693750	681600		290	230cm

DATA REPORT CAPTIONS FOR CAMBRIDGE FJORD - BAFFIN ISLAND DATA REPORT V2

Fig. 10-1A	Total Iron in 6 cores from Cambridge Fjord
Fig. 10-2A	Weak acid (HAc) leachable Iron in 6 cores from Cambridge Fjord
Fig. 10-3A	Reducible fraction of Iron in 6 cores from Cambridge Fjord
Fig. 10-4A	Ratio of weak acid leachable Iron/total Iron in 6 cores from Cambridge Fjord
Fig. 10-5A	Ratio of reducible Iron/total iron in 6 cores from Cambridge Fjord
Fig. 10-6A	Ratio of Labile Iron/total Iron (FeWA + FeHR/FeT) in 6 cores from Cambridge Fjord
Fig. 10-7A	Total Manganese in 6 cores from Cambridge Fjord
Fig. 10-8A	Weak acid leachable Manganese in 6 cores from Cambridge Fjord
Fig. 10-9A	Reducible fraction of Manganese in 6 cores from Cambridge Fjord
Fig. 10-10A	Ratio of weak acid leachable Manganese/total Manganese in 6 cores from Cambridge Fjord
Fig. 10-11A	Ratio of reducible Manganese/total Manganese in 6 cores from Cambridge Fjord
Fig. 10-12A	Ratio of labile manganese/total Manganese in 6 cores from Cambridge Fjord
Fig. 10-13A	Total Zinc in 6 cores from Cambridge Fjord
Fig. 10-14A	Weak acid leachable Zinc in 6 cores from Cambridge Fjord
Fig. 10-15A	Reducible fraction of Zinc in 6 cores from Cambridge Fjord
Fig. 10-16A	Ratio of weak acid leachable Zinc/total Zinc in 6 cores from Cambridge Fjord
Fig. 10-17A	Ratio of reducible Zinc/total Zinc in 6 cores from Cambridge Fjord
Fig. 10-18A	Ratio of labile Zinc/total zinc in 6 cores from Cambridge Fjord
Fig. 10-19A	Total Copper in 6 cores from Cambridge Fjord
Fig. 10-20A	Weak acid leachable Copper in 6 cores from Cambridge Fjord
Fig. 10-21A	Reducible fraction of Copper in 6 cores from Cambridge Fjord
Fig. 10-22A	Ratio of weak acid leachable Copper/total Copper in 6 cores from Cambridge Fjord
Fig. 10-23A	Ratio of reducible Copper/total Copper in 6 cores from Cambridge Fjord
Fig. 10-24A	Ratio of labile Copper/total Copper in 6 cores from Cambridge Fjord
Fig. 10-25A	Total Nickel in 6 cores from Cambridge Fjord
Fig. 10-26A	Weak acid leachable Nickel in 6 cores from Cambridge Fjord
Fig. 10-27A	Reducible fraction of Nickel in 6 cores from Cambridge Fjord
Fig. 10-28A	Ratio of weak acid leachable Nickel/total Nickel in 6 cores from Cambridge Fjord
Fig. 10-29A	Ratio of reducible Nickel/total Nickel in 6 cores from Cambridge Fjord
Fig. 10-30A	Ratio of labile Nickel/total Nickel in 6 cores from Cambridge Fjord
Fig. 10-31A	Total Calcium in 6 cores from Cambridge Fjord
Fig. 10-32A	Total Magnesium in 6 cores from Cambridge Fjord
Fig. 10-33A	Total Silicon in 6 cores from Cambridge Fjord
Fig. 10-34A	Total Aluminum in 6 cores from Cambridge Fjord
Fig. 10-35A	Total Carbon in 6 cores from Cambridge Fjord
Fig. 10-36A	Total organic Carbon in 6 cores from Cambridge Fjord
Fig. 10-37A	Redox potential (oxidation/reduction potential) in 6 cores from Cambridge Fjord
Fig. 10-38A	pH (hydrogen ion) in 6 cores from Cambridge Fjord
Fig. 10-39A	pS (Sulfide ion) in 6 cores from Cambridge Fjord
Fig. 10-40A	Moisture content in 6 cores from Cambridge Fjord

DATA REPORT CAPTIONS FOR ITIRBILUNG FJORD - BAFFIN ISLAND DATA REPORT V.2

Fig. 10-1B.	Total Iron in 7 cores from Itirbilung Fjord
Fig. 10-2B.	Weak acid leachable Iron in 7 cores from Itirbilung Fjord
Fig. 10-3B.	Reducible fraction of Iron in 7 cores from Itirbilung Fjord
Fig. 10-4B.	Ratio of weak acid leachable Iron/total Iron in 7 cores from Itirbilung Fjord
Fig. 10-5B.	Ratio of reducible Iron/total Iron in 7 cores from Itirbilung Fjord
Fig. 10-6B.	Ratio of Labile Iron/total Iron in 7 cores from Itirbilung Fjord
Fig. 10-7B.	Total Manganese in 7 cores from Itirbilung Fjord
Fig. 10-8B.	Weak acid leachable Manganese in 7 cores from Itirbilung Fjord
Fig. 10-9B.	Reducible fraction of Manganese in 7 cores from Itirbilung Fjord
Fig. 10-10B.	Ratio of weak acid leachable Manganese/total Manganese in 7 cores from Itirbilung Fjord
Fig. 10-11B.	Ratio of reducible Manganese/total Manganese in 7 cores from Itirbilung Fjord
Fig. 10-12B.	Ratio of labile Manganese/total Manganese in 7 cores from Itirbilung Fjord
Fig. 10-13B.	Total Zinc in 7 cores from Itirbilung Fjord
Fig. 10-14B.	Weak acid leachable Zinc in 7 cores from Itirbilung Fjord
Fig. 10-15B.	Reducible fraction of Zinc in 7 cores from Itirbilung Fjord
Fig. 10-16B.	Ratio of weak acid leachable Zinc/total Zinc in 7 cores from Itirbilung Fjord
Fig. 10-17B.	Ratio of reducible Zinc/total Zinc in 7 cores from Itirbilung Fjord
Fig. 10-18B.	Ratio of labile Zinc/total Zinc in 7 cores from Itirbilung Fjord
Fig. 10-19B.	Total Copper in 7 cores from Itirbilung Fjord
Fig. 10-20B.	Weak acid leachable Copper in 7 cores from Itirbilung Fjord
Fig. 10-21B.	Reducible fraction of Copper in 7 cores from Itirbilung Fjord
Fig. 10-22B.	Ratio of Weak acid leachable Copper/total Copper in 7 cores from Itirbilung Fjord
Fig. 10-23B.	Ratio of reducible Copper/total Copper in 7 cores from Itirbilung Fjord
Fig. 10-24B.	Ratio of labile Copper/total Copper in 7 cores from Itirbilung Fjord
Fig. 10-25B.	Total Nickel in 7 cores from Itirbilung Fjord
Fig. 10-26B.	Weak acid leachable Nickel in 7 cores from Itirbilung Fjord
Fig. 10-27B.	Reducible fraction of Nickel in 7 cores from Itirbilung Fjord
Fig. 10-28B.	Ratio of weak acid leachable Nickel/total Nickel in 7 cores from Itirbilung Fjord
Fig. 10-29B.	Ratio of reducible Nickel/total Nickel in 7 cores from Itirbilung Fjord
Fig. 10-30B.	Ratio of label Nickel/total Nickel in 7 cores from Itirbilung Fjord
Fig. 10-31B.	Total Calcium in 7 cores from Itirbilung Fjord
Fig. 10-32B.	Total Mangnesium in 7 cores from Itirbilung Fjord
Fig. 10-33B.	Total Silicon in 7 cores from Itirbilung Fjord
Fig. 10-34B.	Total Aluminum in 7 cores from Itirbilung Fjord
Fig. 10-35B.	Total Carbon in 7 cores from Itirbilung Fjord
Fig. 10-36B.	Redox potential in 7 cores from Itirbilung Fjord
Fig. 10-37B.	pH in 7 cores from Itirbilung Fjord
Fig. 10-38B.	pS in 7 cores from Itirbilung Fjord
Fig. 10-39B.	Moisture content in 7 cores from Itirbilung Fjord

DATA REPORT CAPTIONS FOR MCBETH FJORD - BAFFIN ISLAND DATA REPORT V2

Fig. 10-1C	Total Iron in 5 cores from McBeth Fjord
Fig. 10-2C	Weak acid leachable Iron in 5 cores from McBeth Fjord
Fig. 10-3C	Reducible fraction of Iron in 5 cores from McBeth Fjord
Fig. 10-4C	Ratio of weak acid leachable Iron/total Iron in 5 cores from McBeth Fjord
Fig. 10-5C	Ratio of reducible Iron/total Iron in 5 cores from McBeth Fjord
Fig. 10-6C	Ratio of labile Iron/total Iron in 5 cores from McBeth Fjord
Fig. 10-7C	Total Manganese in 5 cores from McBeth Fjord
Fig. 10-8C	Weak acid leachable Manganese in 5 cores from McBeth Fjord
Fig. 10-9C	Reducible fraction of Manganese in 5 cores from McBeth Fjord
Fig. 10-10C	Weak acid leachable Manganese/total Manganese in 5 cores from McBeth Fjord
Fig. 10-11C	Ratio of reducible Manganese/total Manganese in 5 cores from McBeth Fjord
Fig. 10-12C	Ratio of labile Manganese/total Manganese in 5 cores from McBeth Fjord
Fig. 10-13C	Total Zinc in 5 cores from McBeth Fjord
Fig. 10-14C	Weak acid leachable Zinc in 5 cores from McBeth Fjord
Fig. 10-15C	Reducible fraction of Zinc in 5 cores from McBeth Fjord
Fig. 10-16C	Ratio of weak acid leachable Zinc/total Zinc in 5 cores from McBeth Fjord
Fig. 10-17C	Ratio of reducible Zinc/total Zinc in 5 cores from McBeth Fjord
Fig. 10-18C	Ratio of labile Zinc/total Zinc in 5 cores from McBeth Fjord
Fig. 10-19C	Total Copper in 5 cores from McBeth Fjord
Fig. 10-20C	Weak acid leachable Copper in 5 cores from McBeth Fjord
Fig. 10-21C	Reducible fraction of Copper in 5 cores from McBeth Fjord
Fig. 10-22C	Ratio of weak acid leachable Copper/total Copper in 5 cores from McBeth Fjord
Fig. 10-23C	Ratio of Reducible Copper/total Copper in 5 cores from McBeth Fjord
Fig. 10-24C	Ratio of labile Copper/total Copper in 5 cores from McBeth Fjord
Fig. 10-25C	Total Nickel in 5 cores from McBeth Fjord
Fig. 10-26C	Weak acid leachable Nickel in 5 cores from McBeth Fjord
Fig. 10-27C	Reducible fraction of Nickel in 5 cores from McBeth Fjord
Fig. 10-28C	Ratio of weak acid leachable Nickel/total Nickel in 5 cores from McBeth Fjord
Fig. 10-29C	Ratio of reducible Nickel/total Nickel in 5 cores from McBeth Fjord
Fig. 10-30C	Ratio of labile Nickel/total Nickel in 5 cores from McBeth Fjord
Fig. 10-31C	Total Calcium in 5 cores from McBeth Fjord
Fig. 10-32C	Total Magnesium in 5 cores from McBeth Fjord
Fig. 10-33C	Total Silicon in 5 cores from McBeth Fjord
Fig. 10-34C	Total Aluminum in 5 cores from McBeth Fjord
Fig. 10-35C	Total Carbon in 5 cores from McBeth Fjord
Fig. 10-36C	Redox potential in 5 cores from McBeth Fjord
Fig. 10-37C	pH of 5 cores from McBeth Fjord
Fig. 10-38C	pS of 5 cores from McBeth Fjord
Fig. 10-39C	Moisture content in 5 cores from McBeth Fjord

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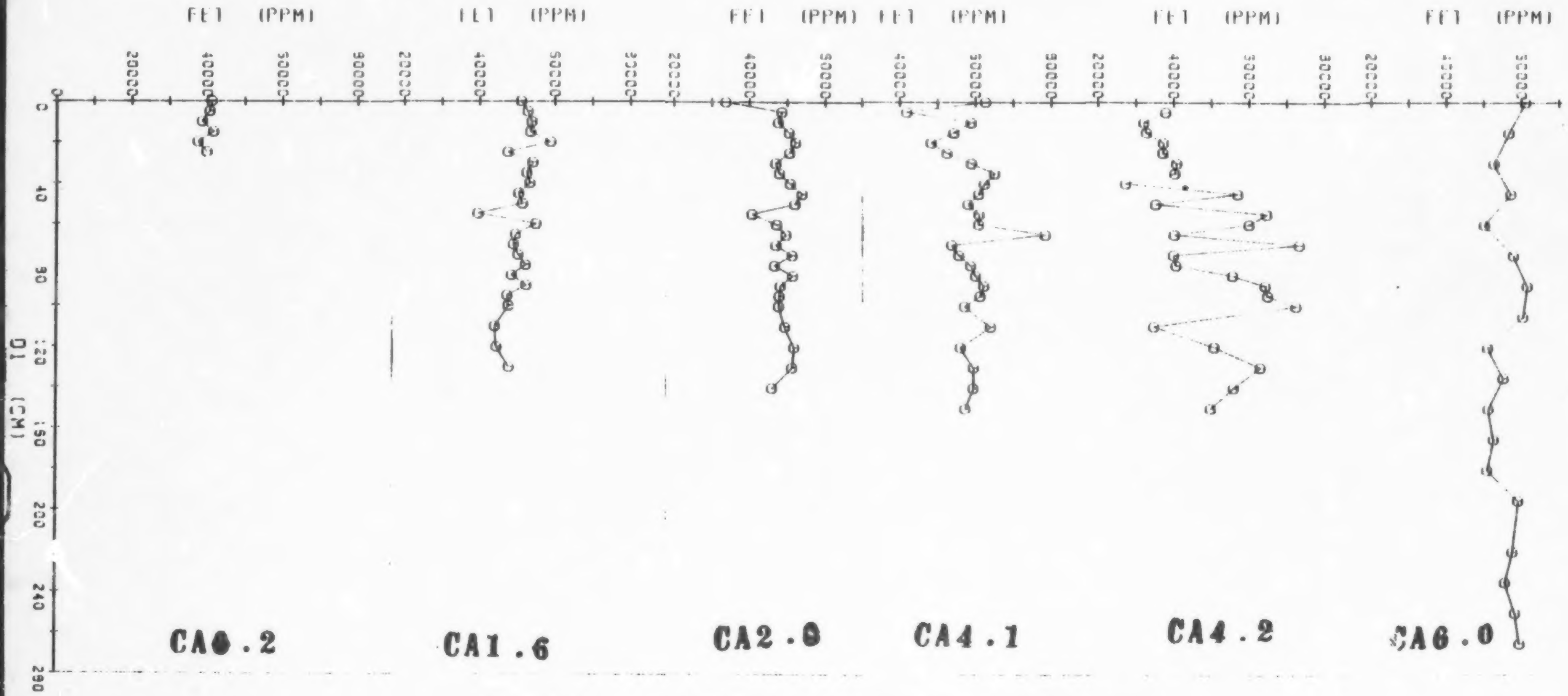


Fig. 10-1A Total Iron in 6 cores from Cambridge Fjord

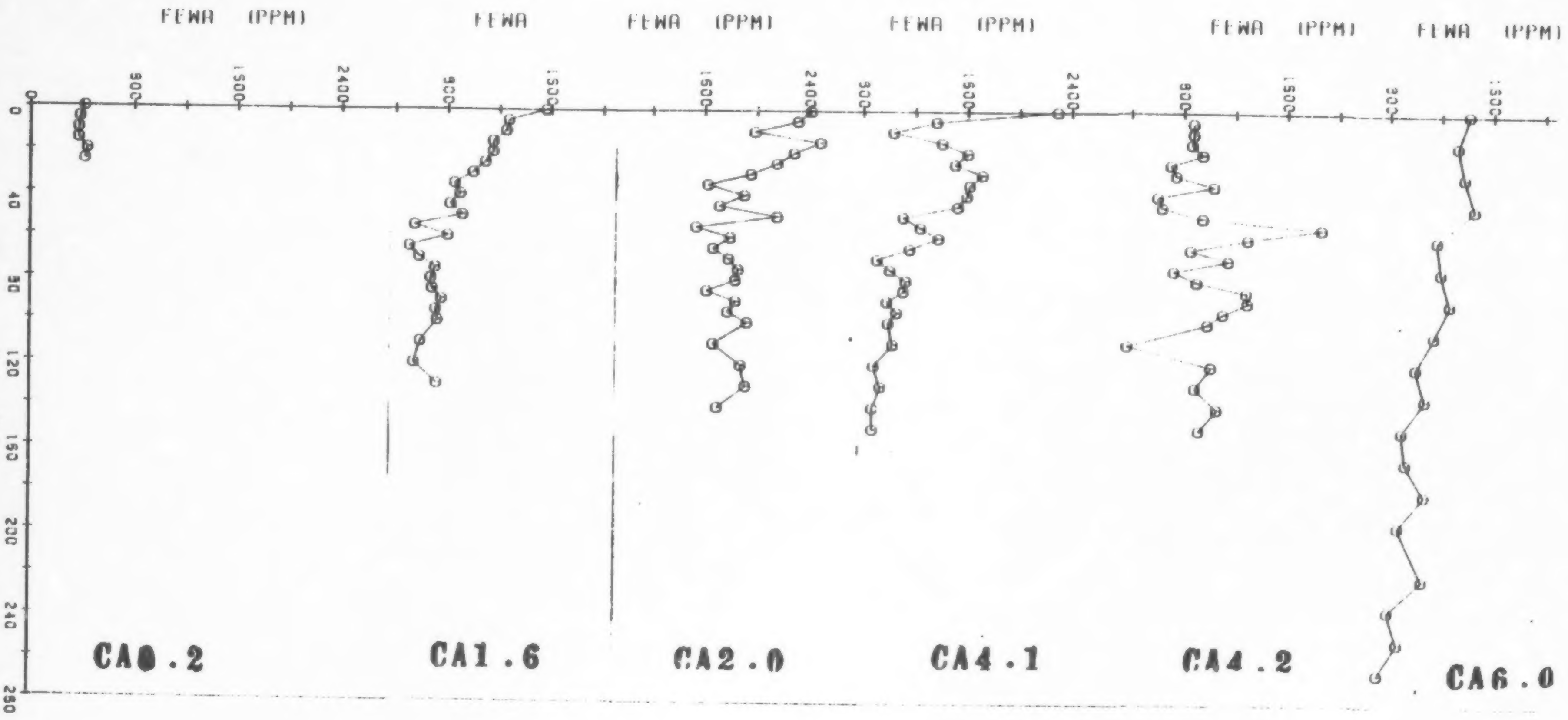


Fig. 10-2A Weak acid (HAc) leachable Iron in 6 cores from Cambridge Fjord

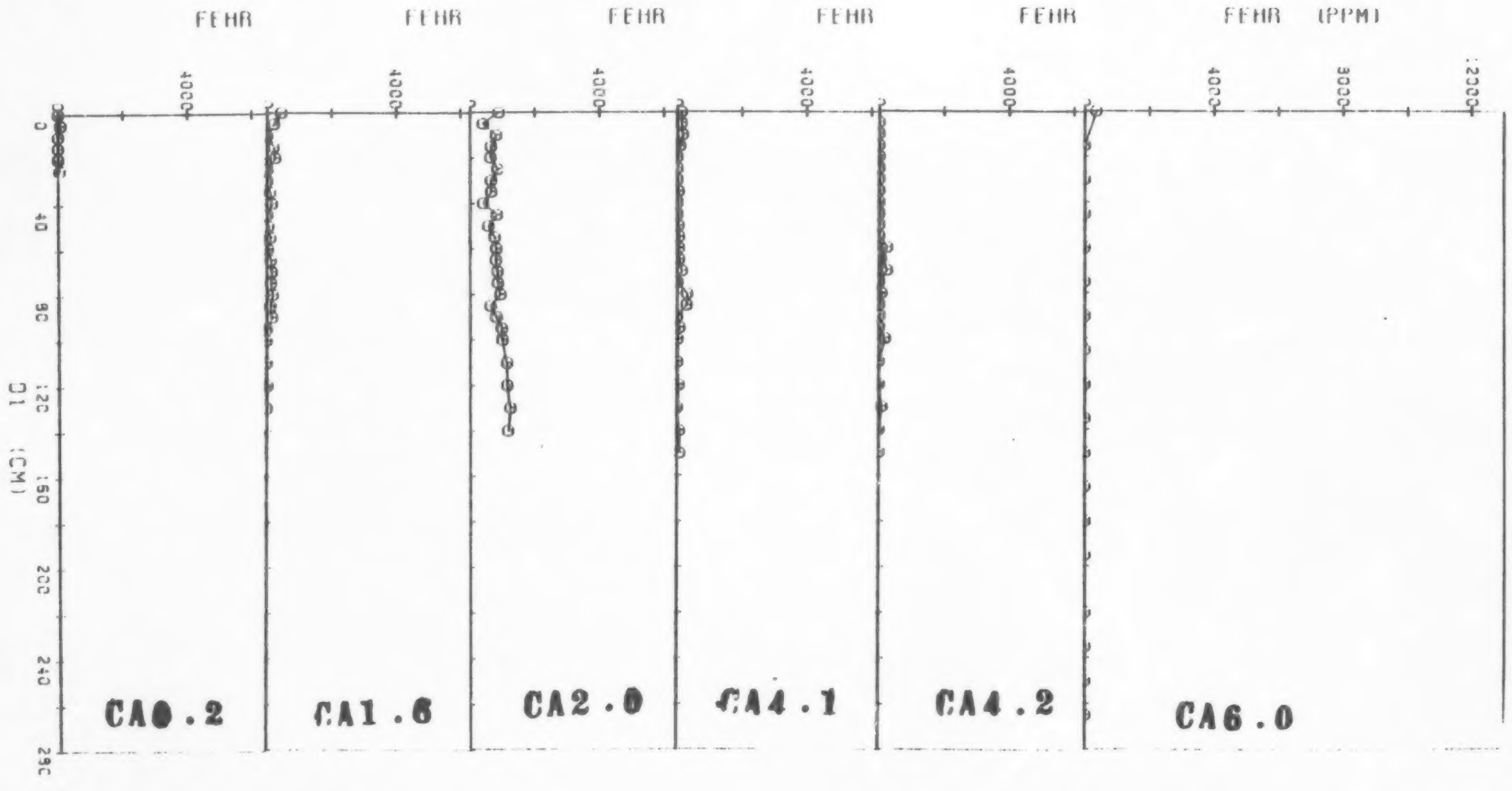


Fig. 10-3A Reducible fraction of Iron in 6 cores from Cambridge Fjord

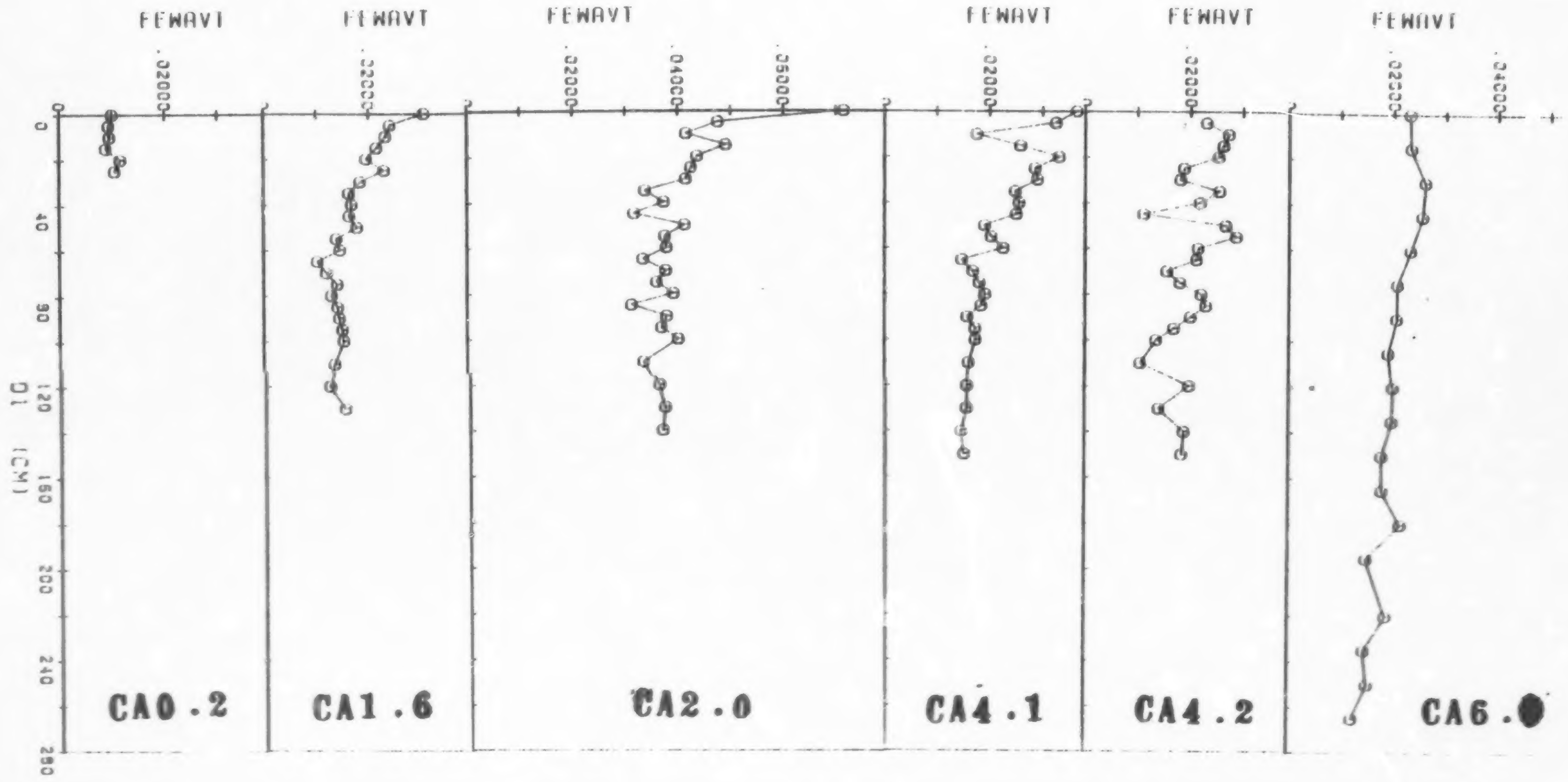


Fig. 10-4A Ratio of weak acid leachable Iron/total Iron in 6 cores from Cambridge Fjord

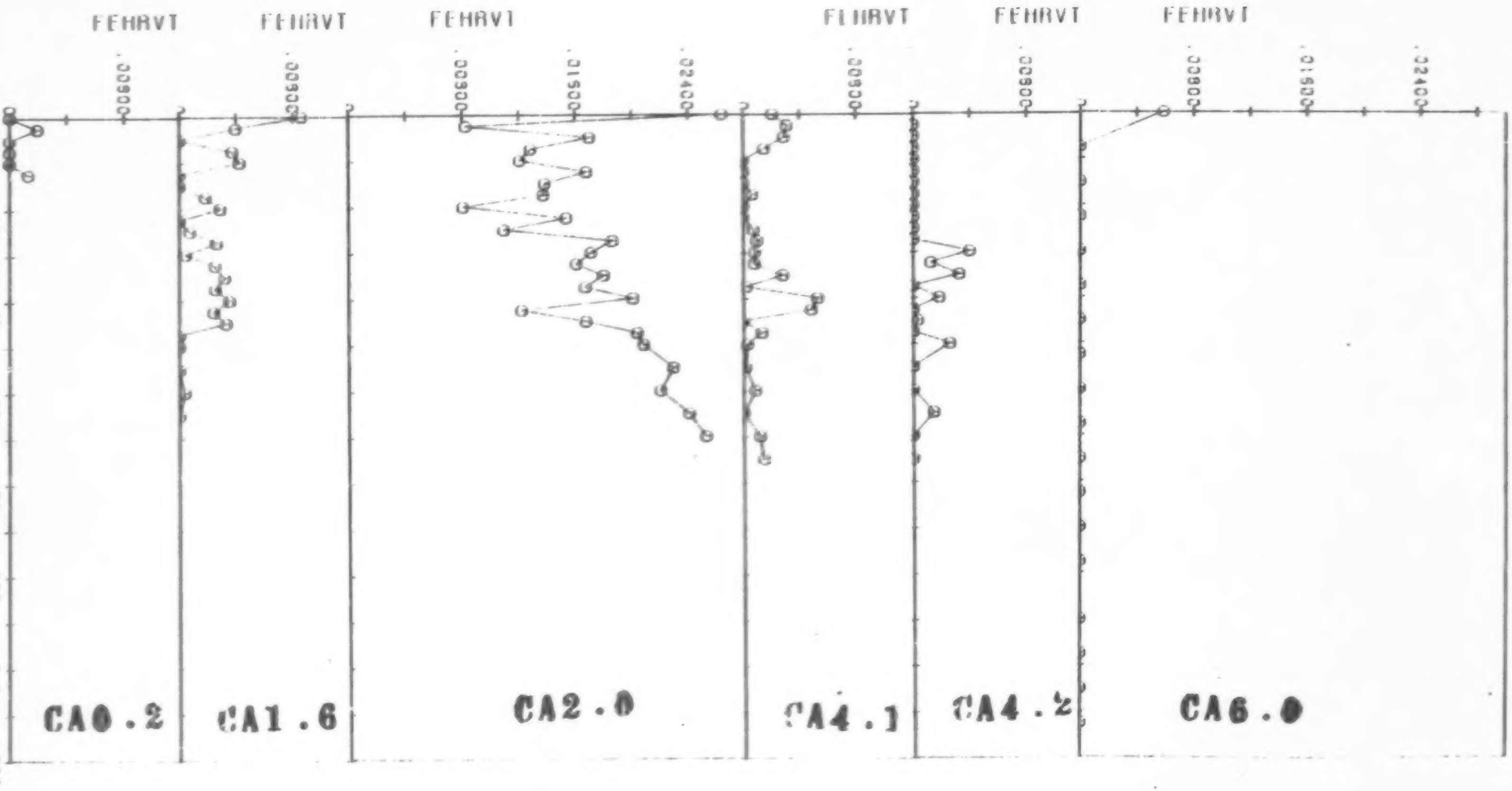


Fig. 10-5A Ratio of reducible Iron/total iron in 6 cores from Cambridge Fjord

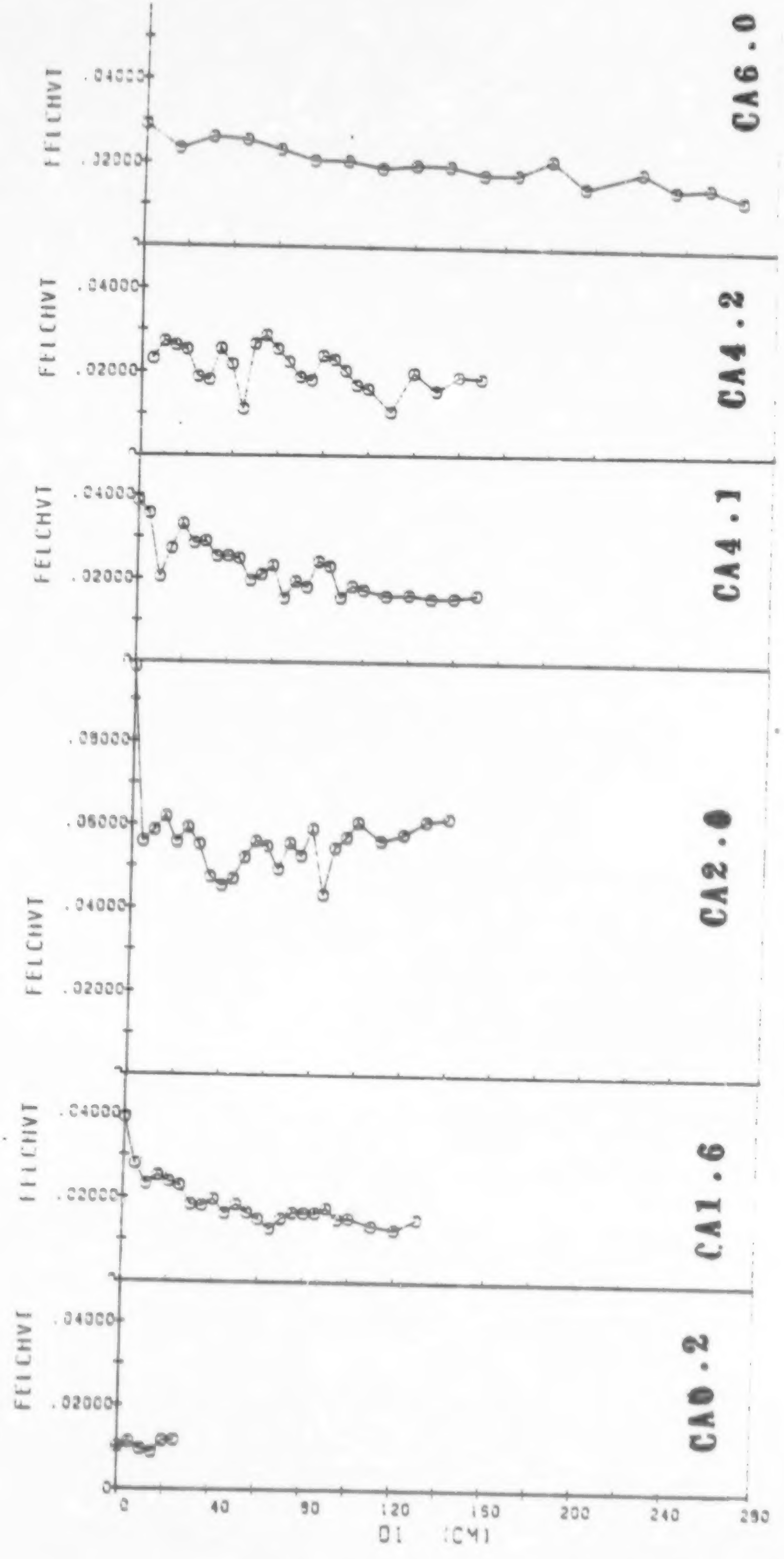


Fig. 10-6A Ratio of Labile Iron/total Iron (FeWA + FeHR/FeT) in 6 cores from Cambridge Fjord

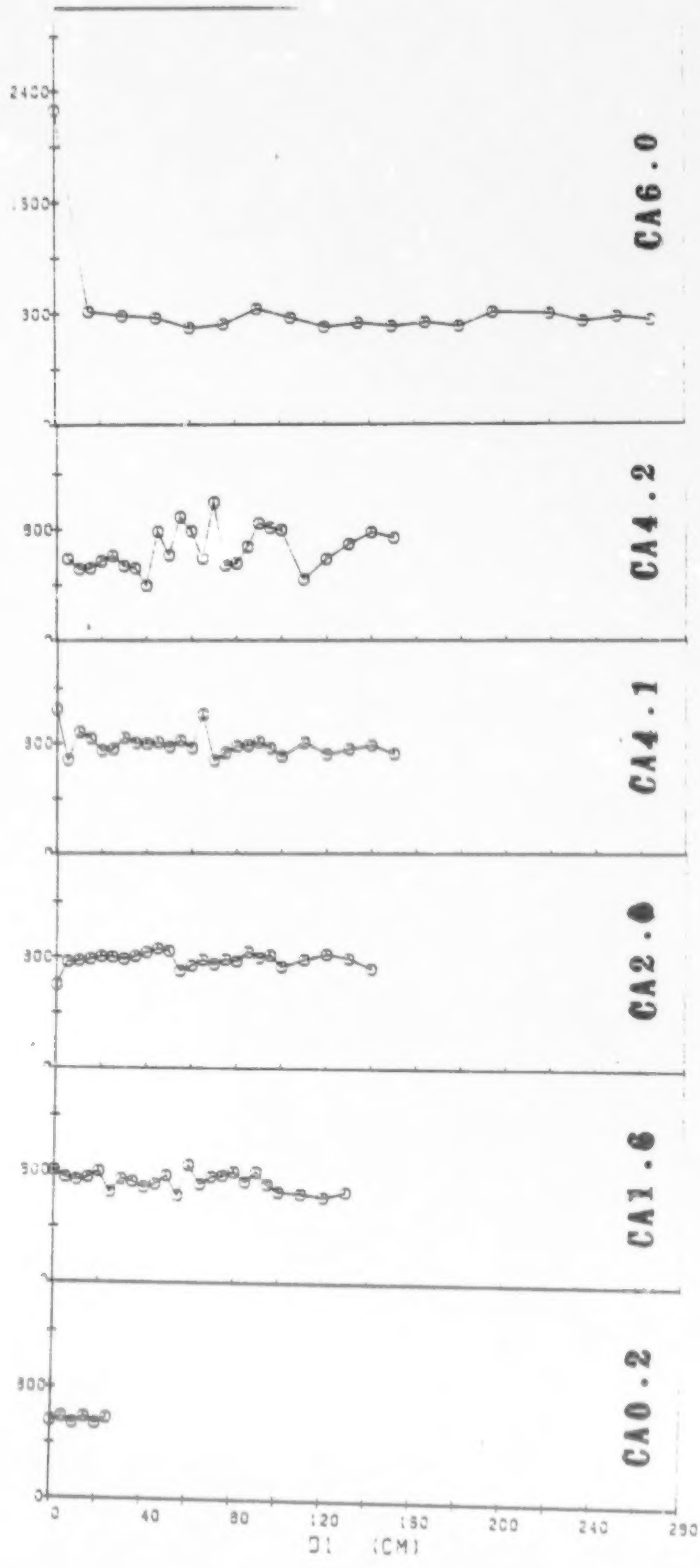


Fig. 10-7A Total Manganese in 6 cores from Cambridge Fjord

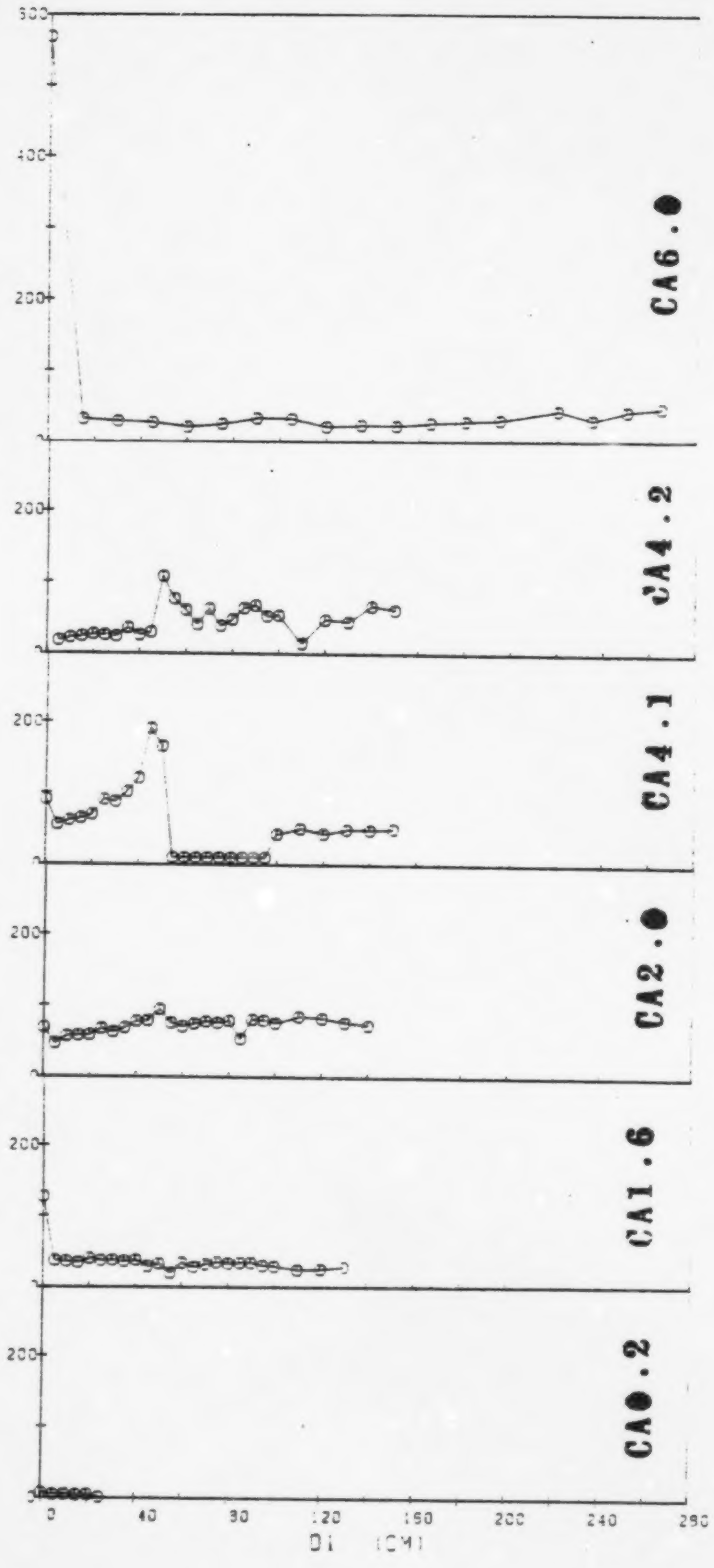


Fig. 10-8A Weak acid leachable Manganese in 6 cores from Cambridge Fjord

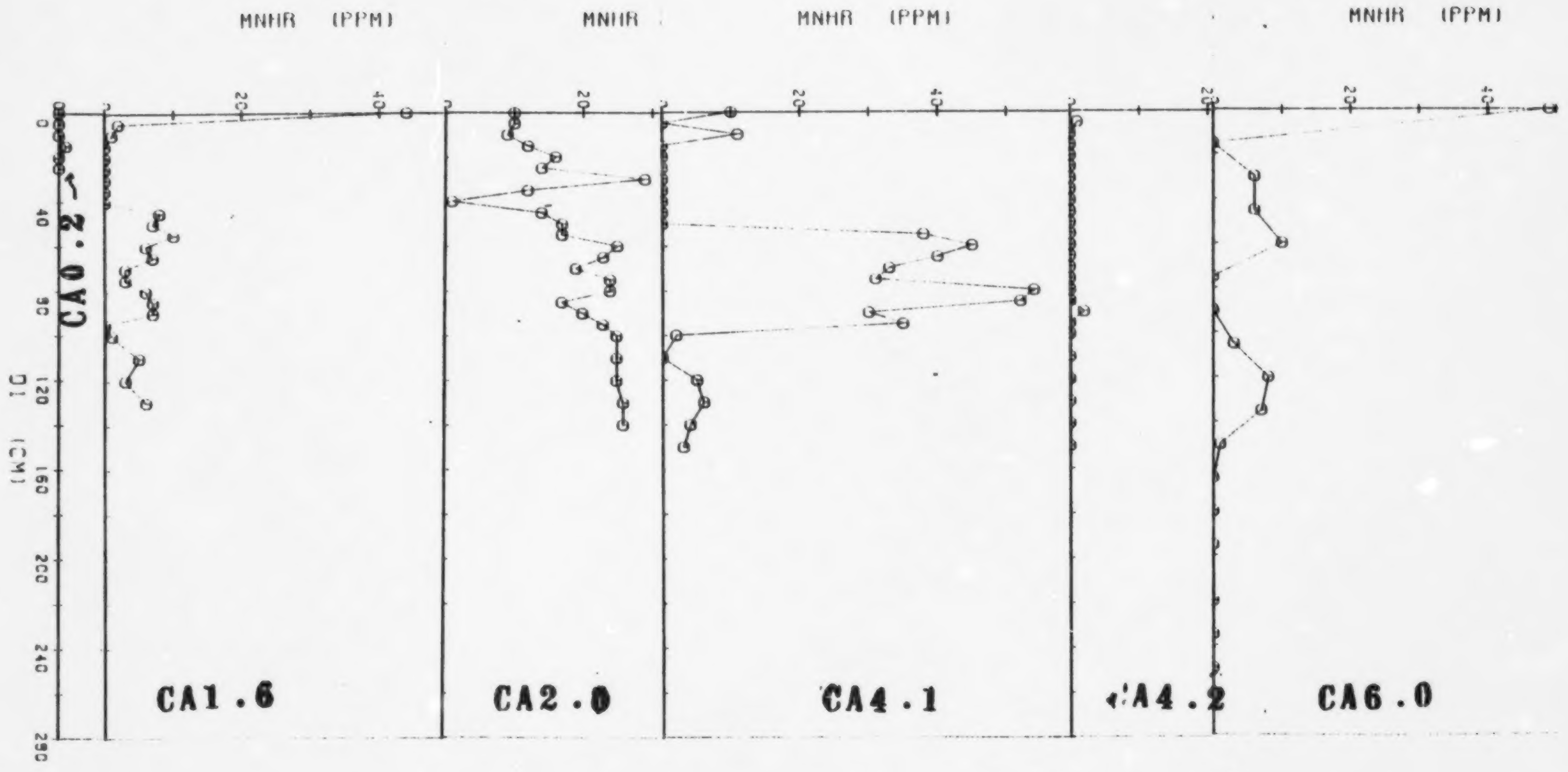


Fig. 10-9A Reducible fraction of Manganese in 6 cores from Cambridge Fjord

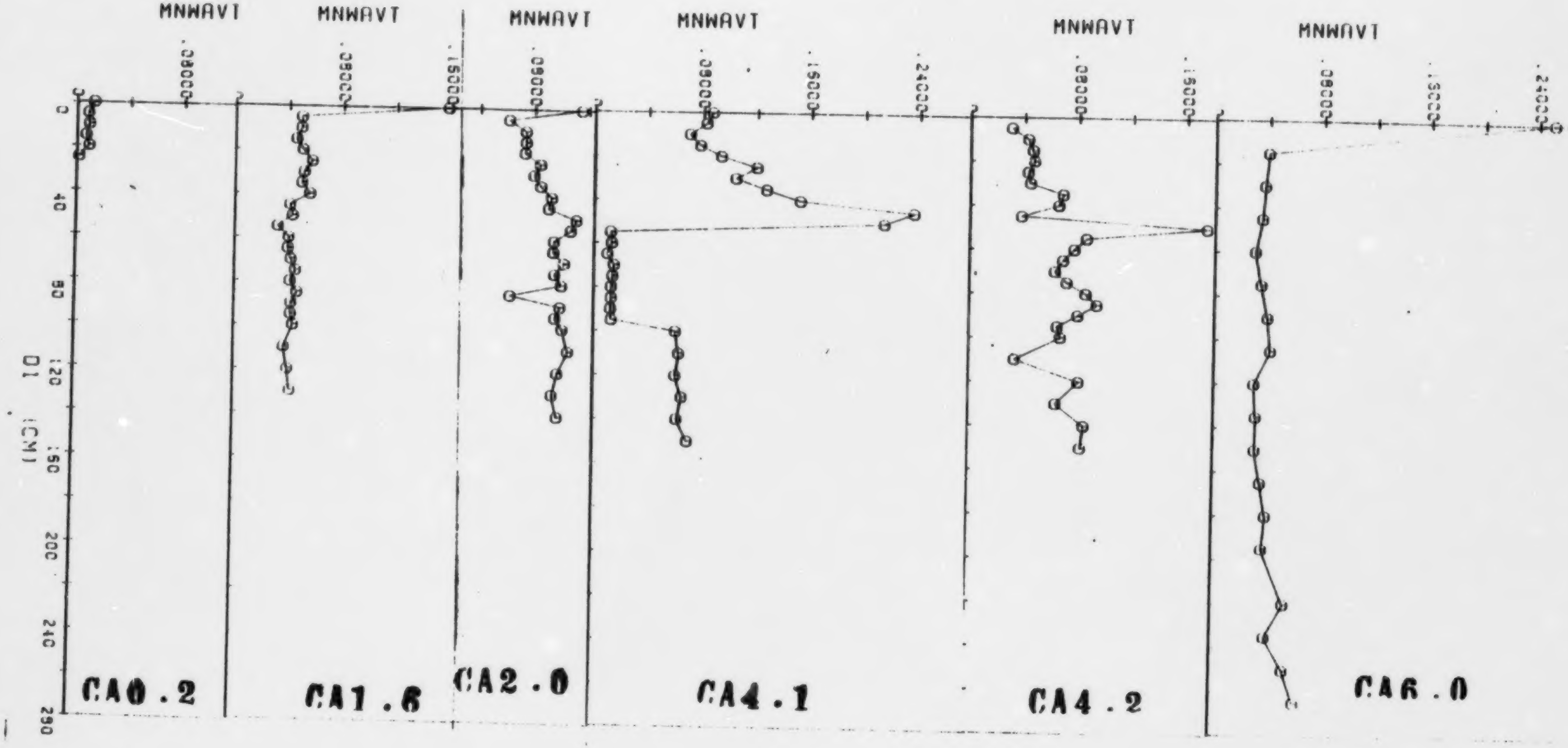


Fig. 10-10A Ratio of weak acid leachable Manganese/total Manganese in 6 cores from Cambridge Fjord

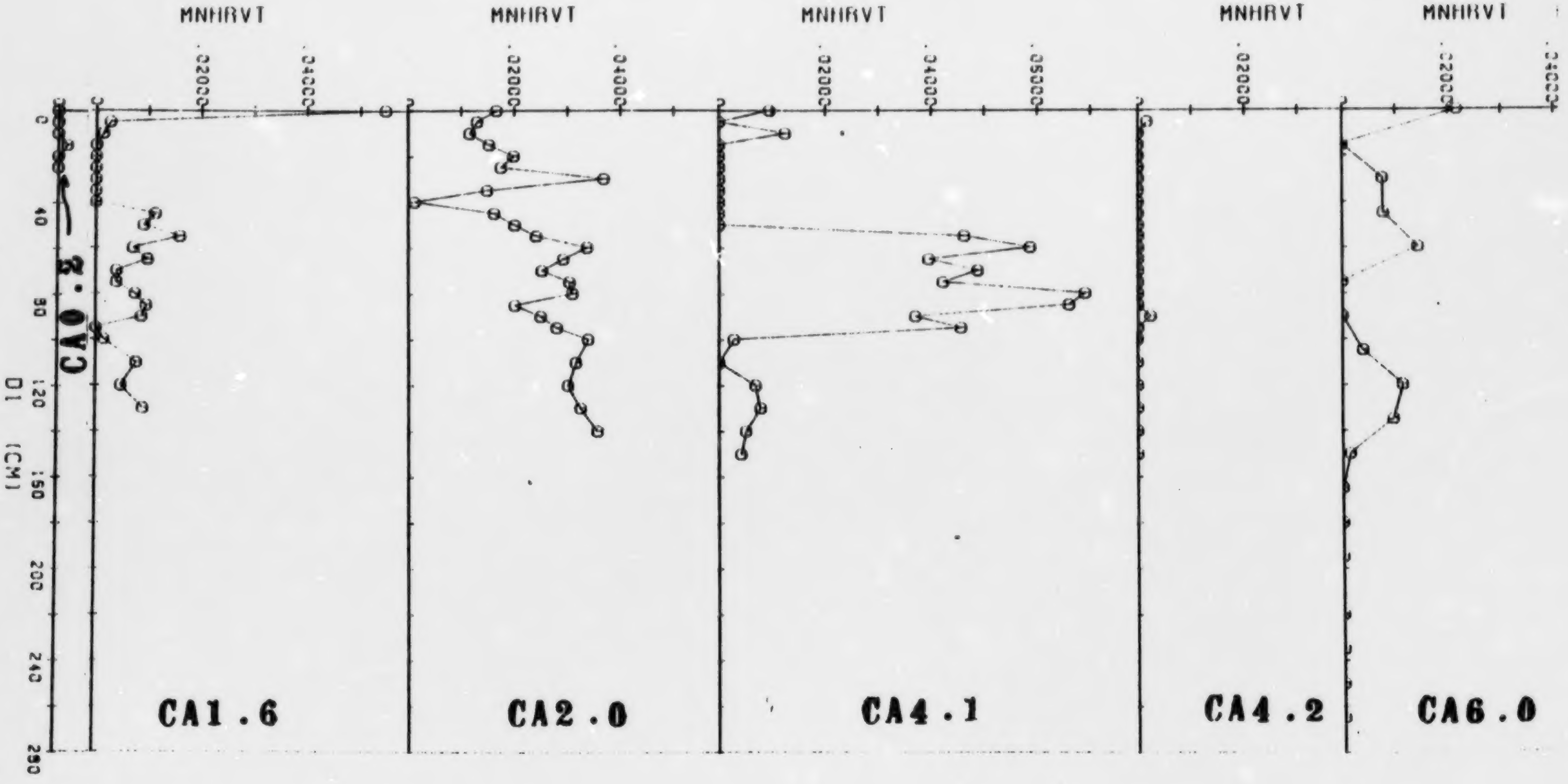


Fig. 10-11A Ratio of reducible Manganese/total Manganese in 6 cores from Cambridge Fjord

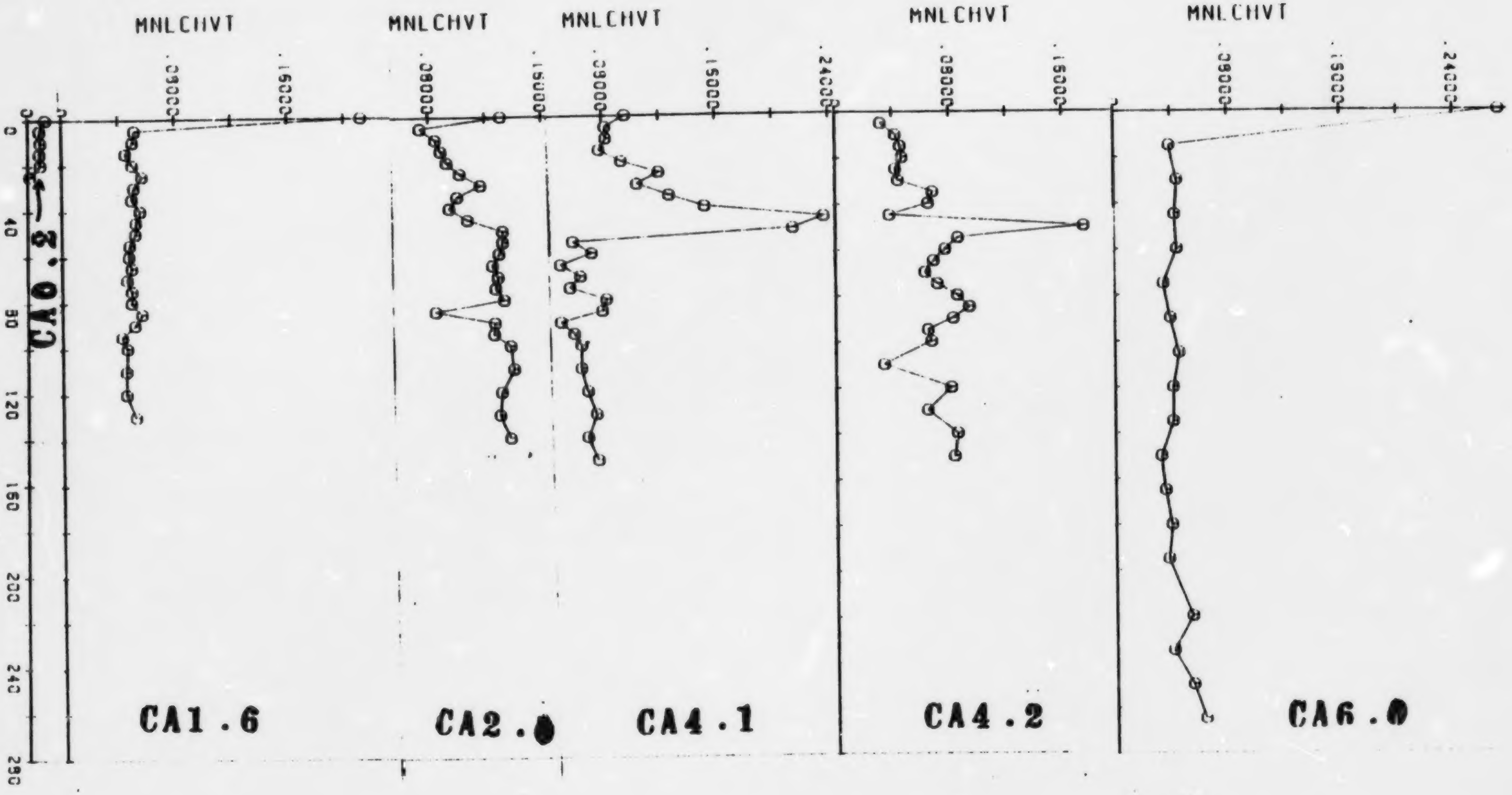


Fig. 10-12A Ratio of labile Manganese/total Manganese in 6 cores from Cambridge Fjord

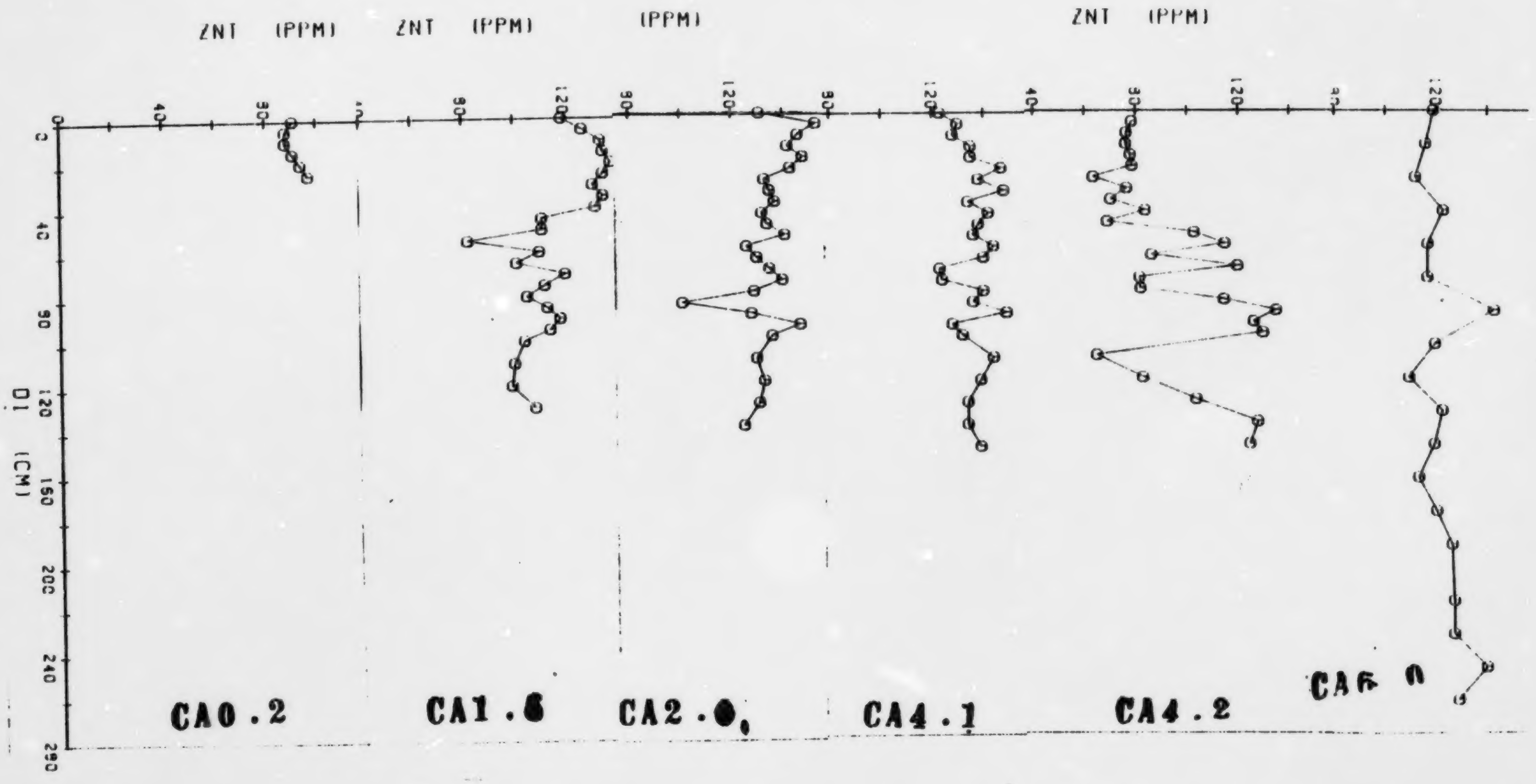


Fig. 10-13A Total Zinc in 6 cores from Cambridge Fjord

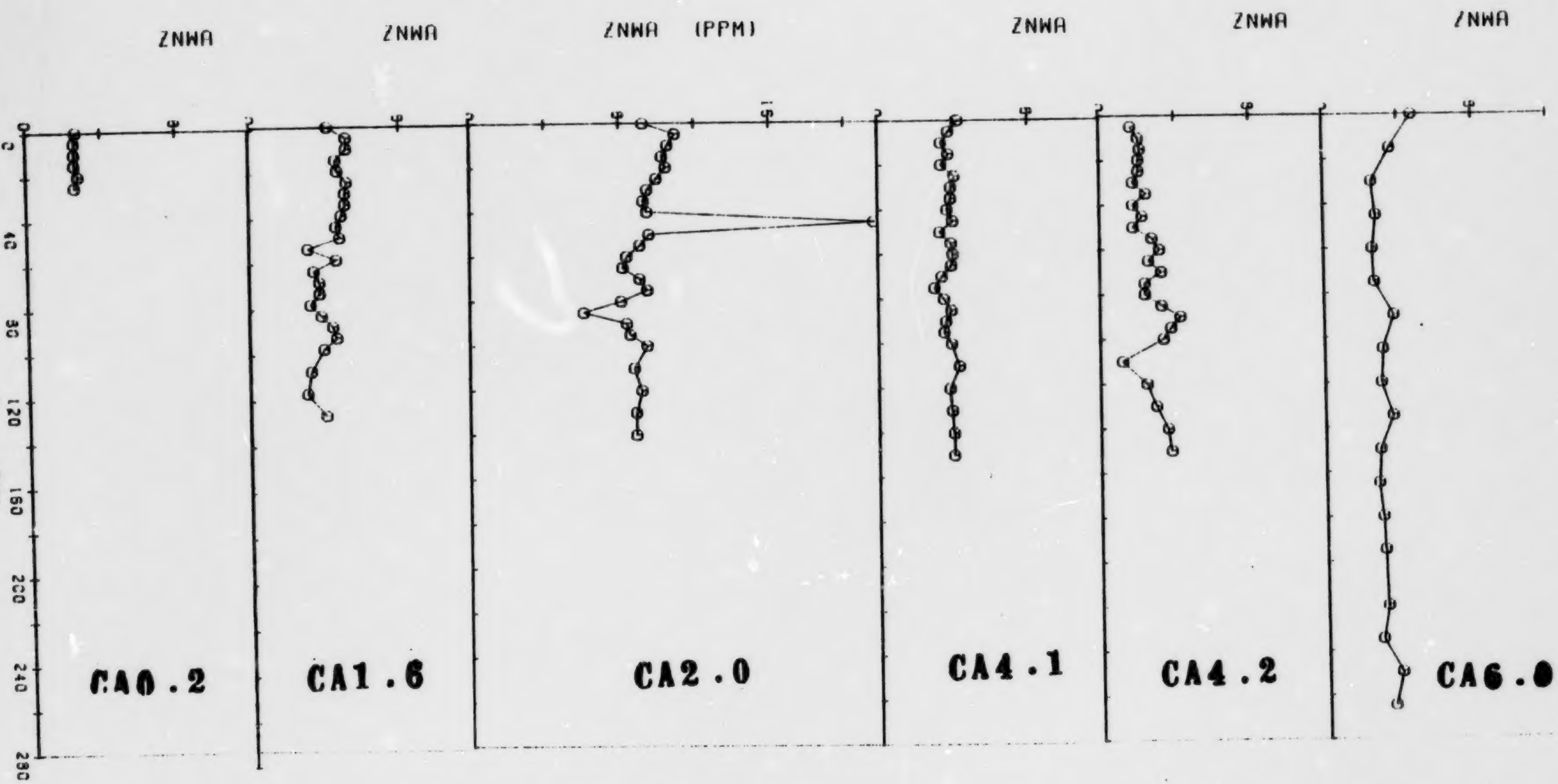


Fig. 10-14A Weak Acid Leachable Zinc in 6 cores from Cambridge Fjord

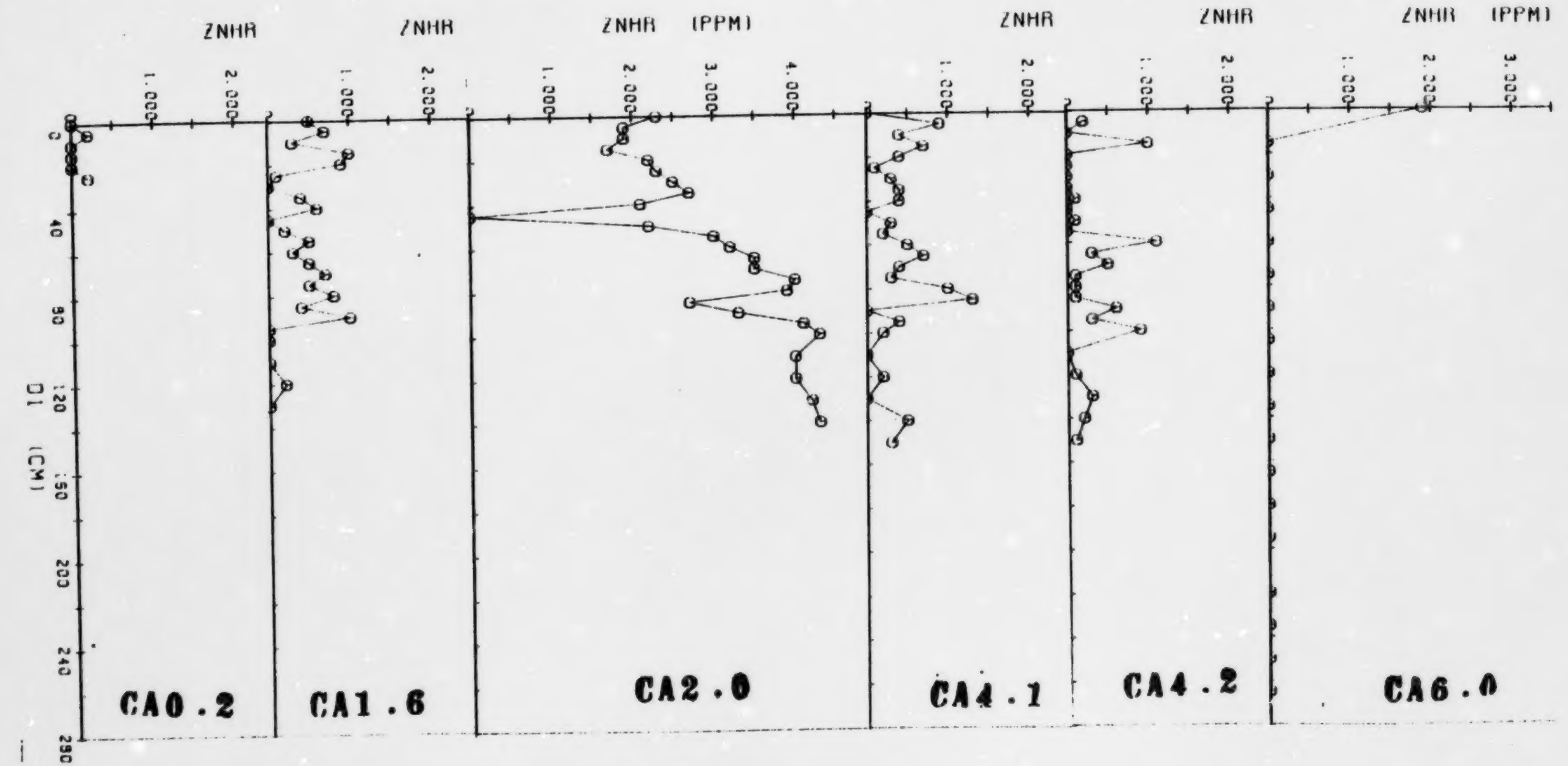


Fig. 10-15A Reducible fraction of Zinc in 6 cores from Cambridge Fjord

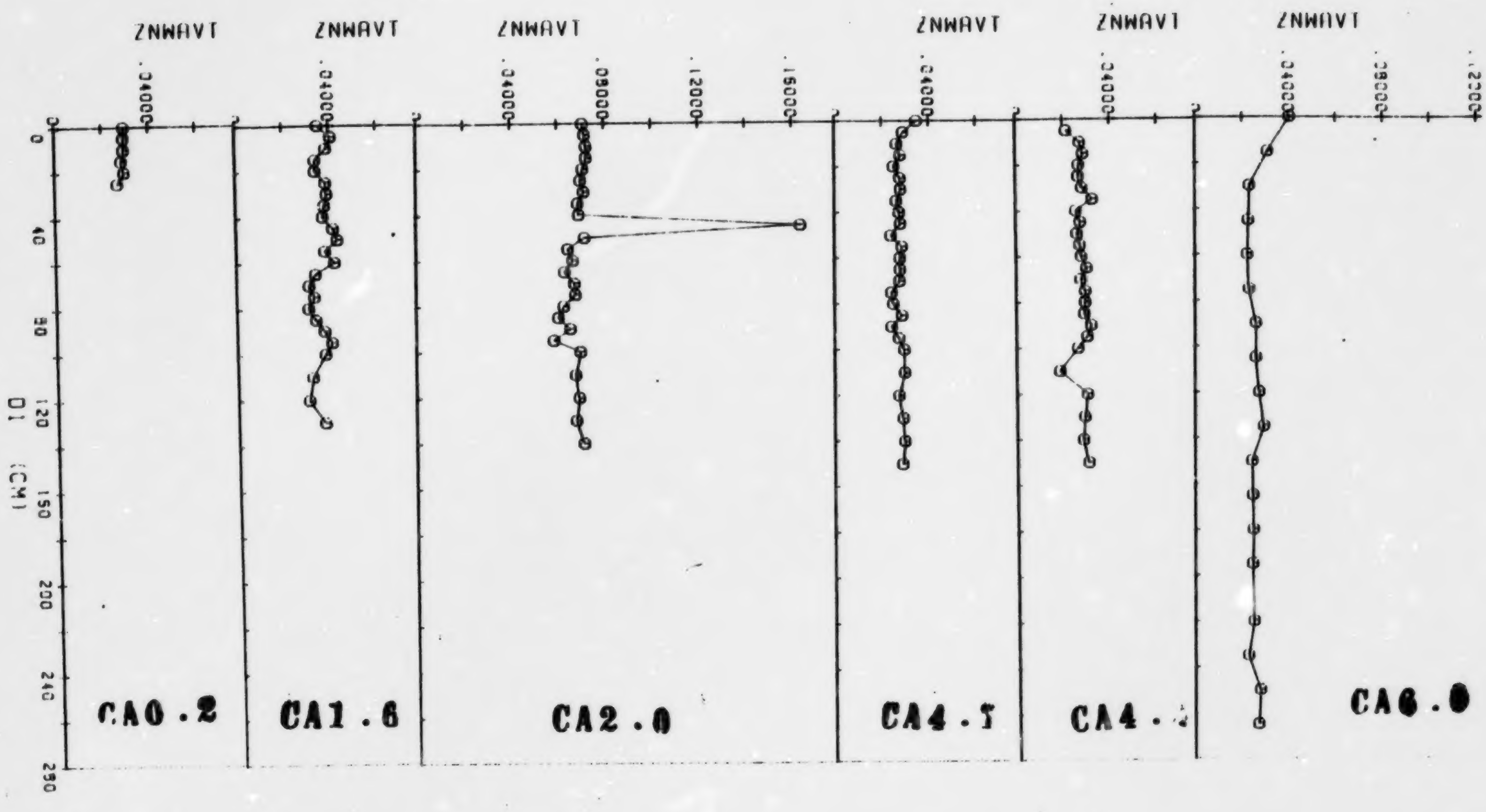


Fig. 10-16A Ratio of weak acid leachable Zinc/total Zinc in 6 cores from Cambridge Fjord

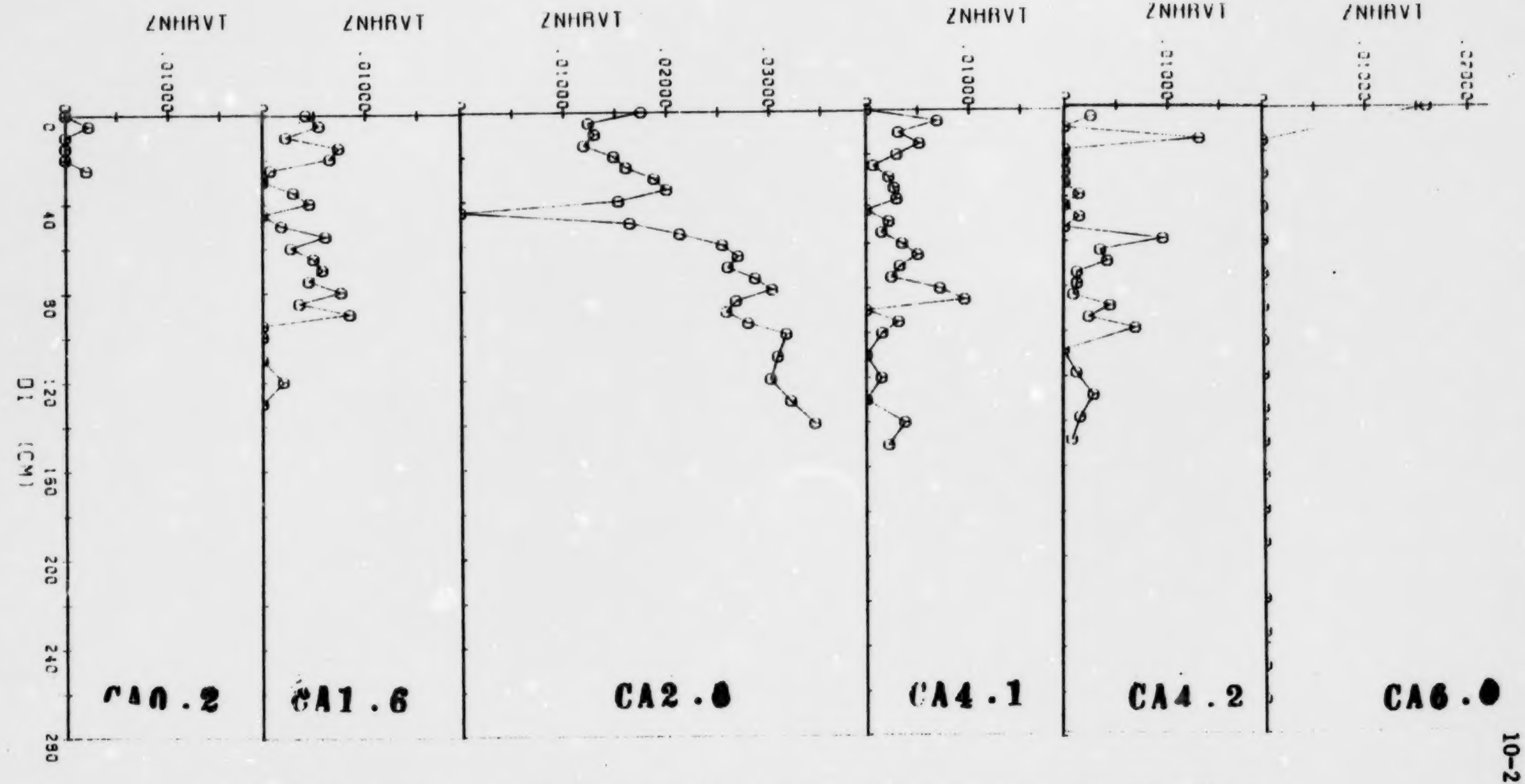


Fig. 10-17A Ratio of reducible Zinc/total Zinc in 6 cores from Cambridge Fjord

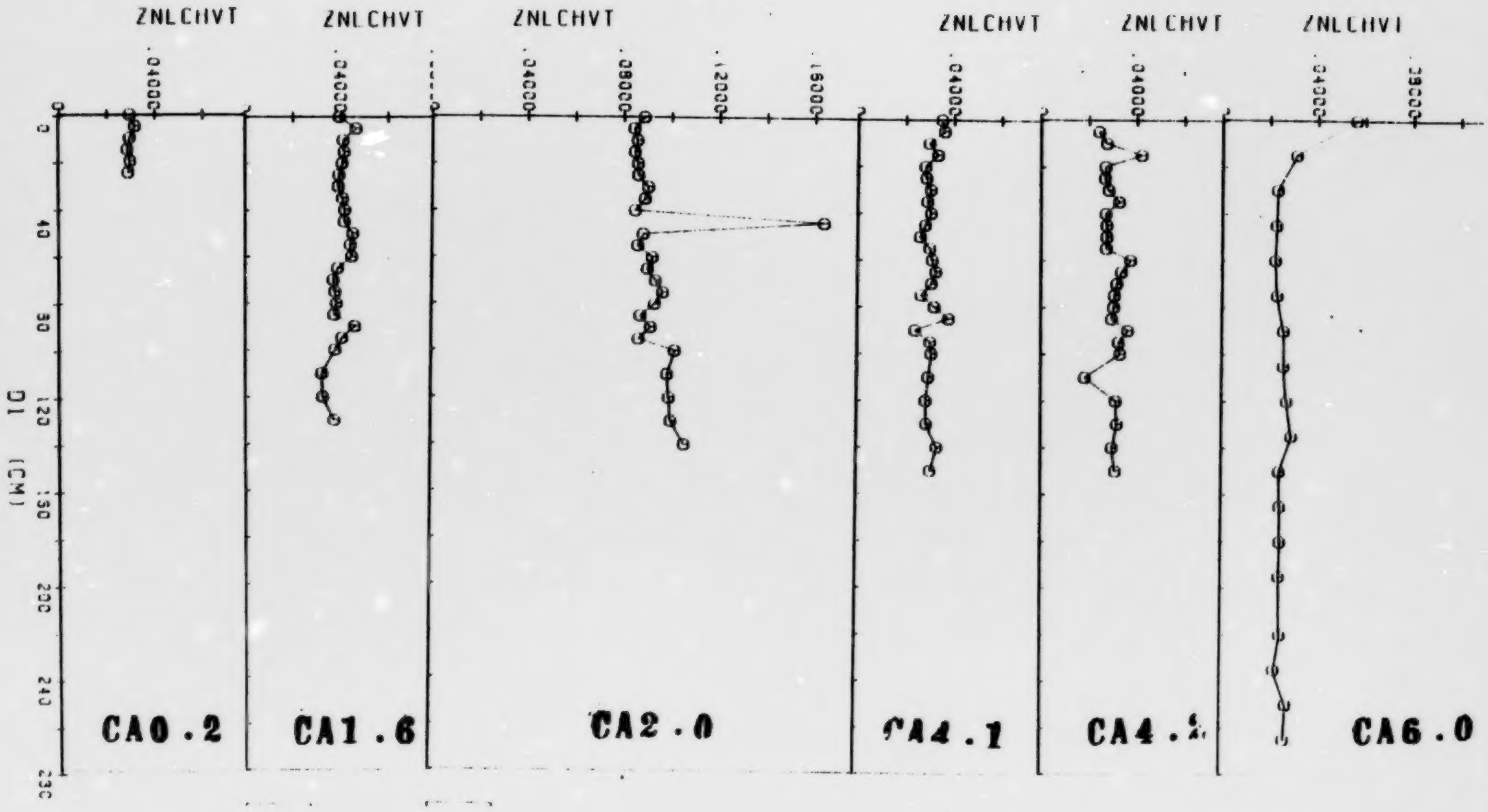


Fig. 10-18A Ratio of labile Zinc/total zinc in 6 cores from Cambridge Fjord

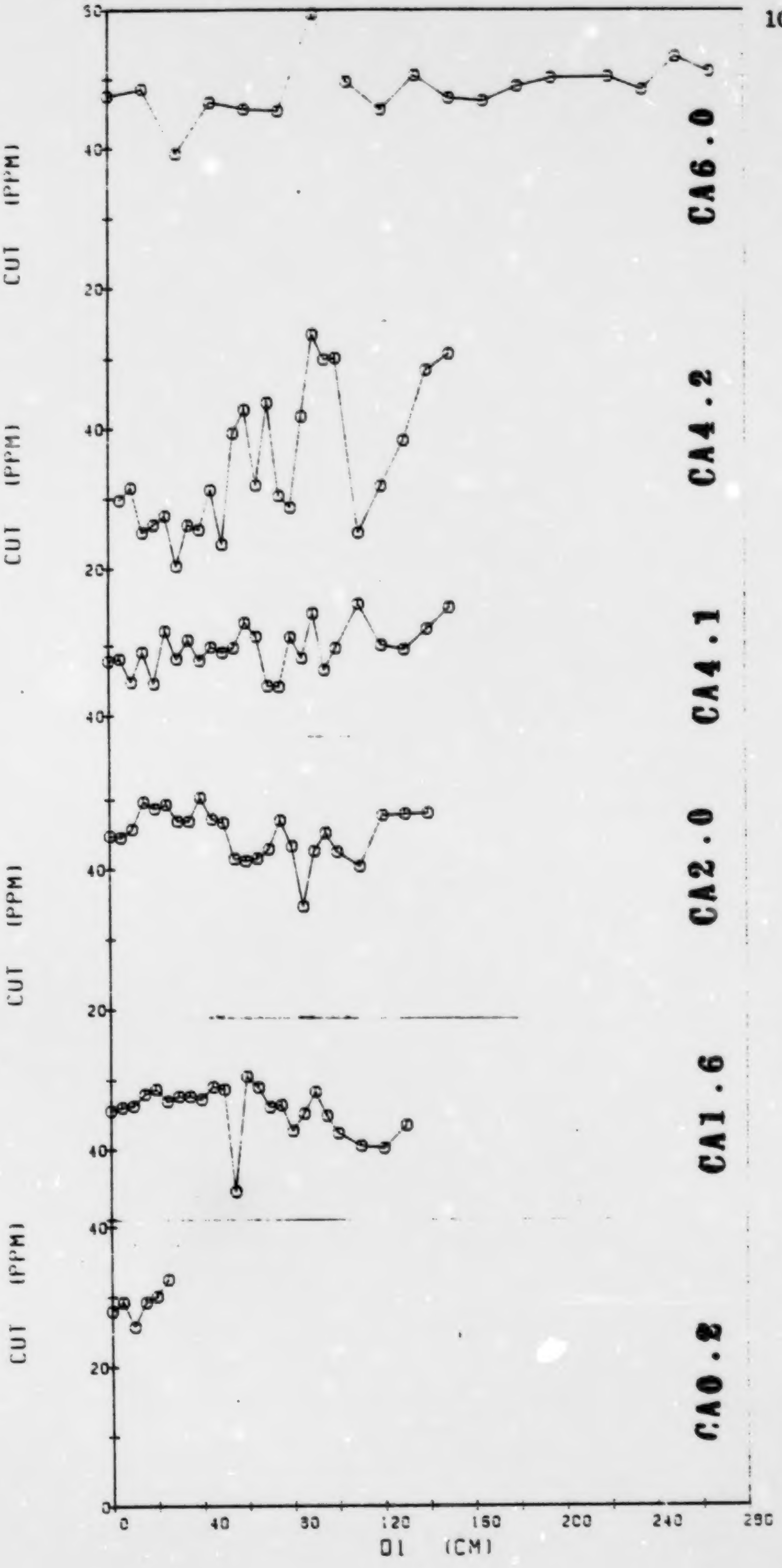


Fig. 10-19A Total Copper in 6 cores from Cambridge Fjord

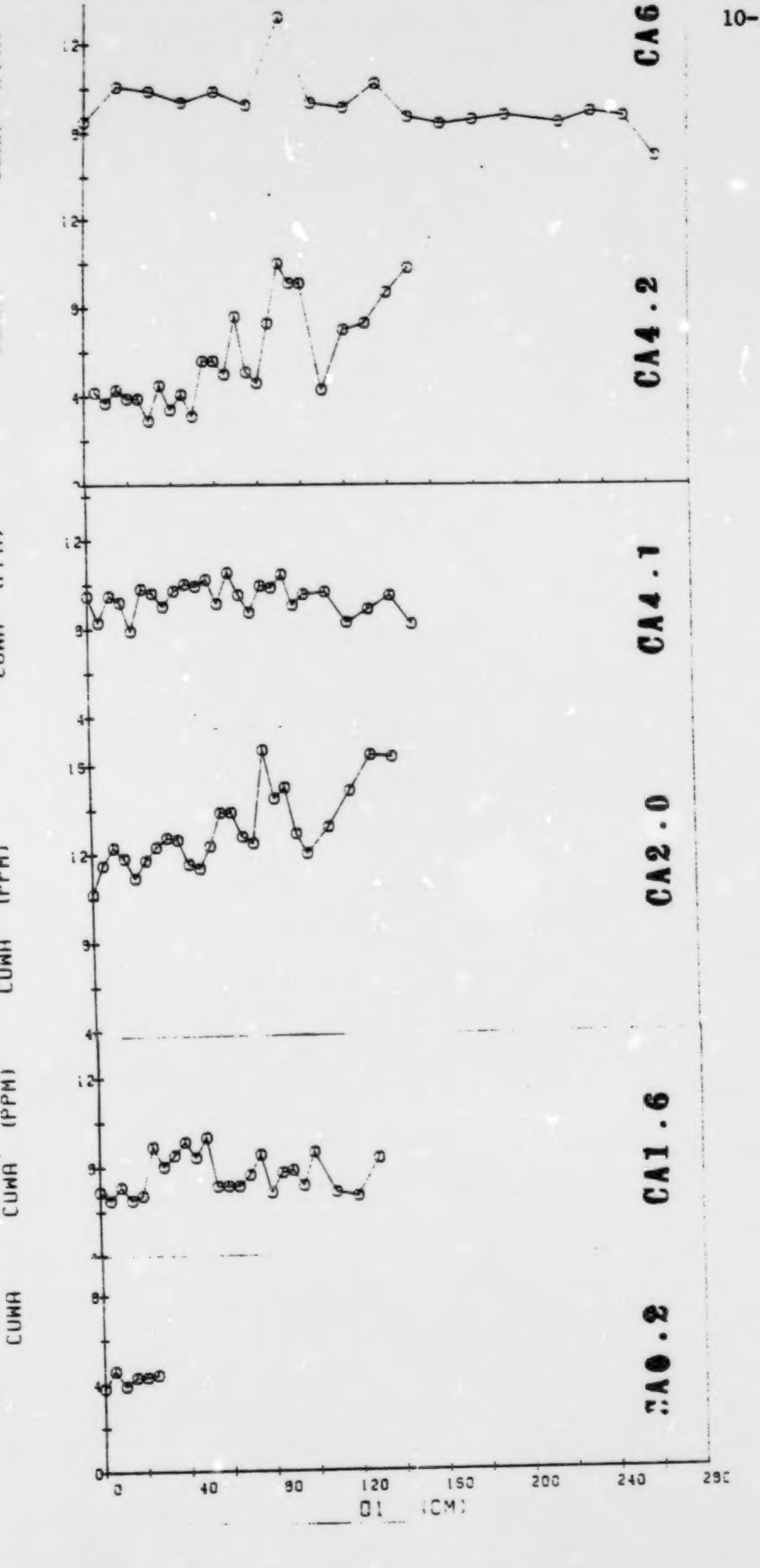


Fig. 10-20A Weak acid leachable Copper in 6 cores from Cambridge Fjord

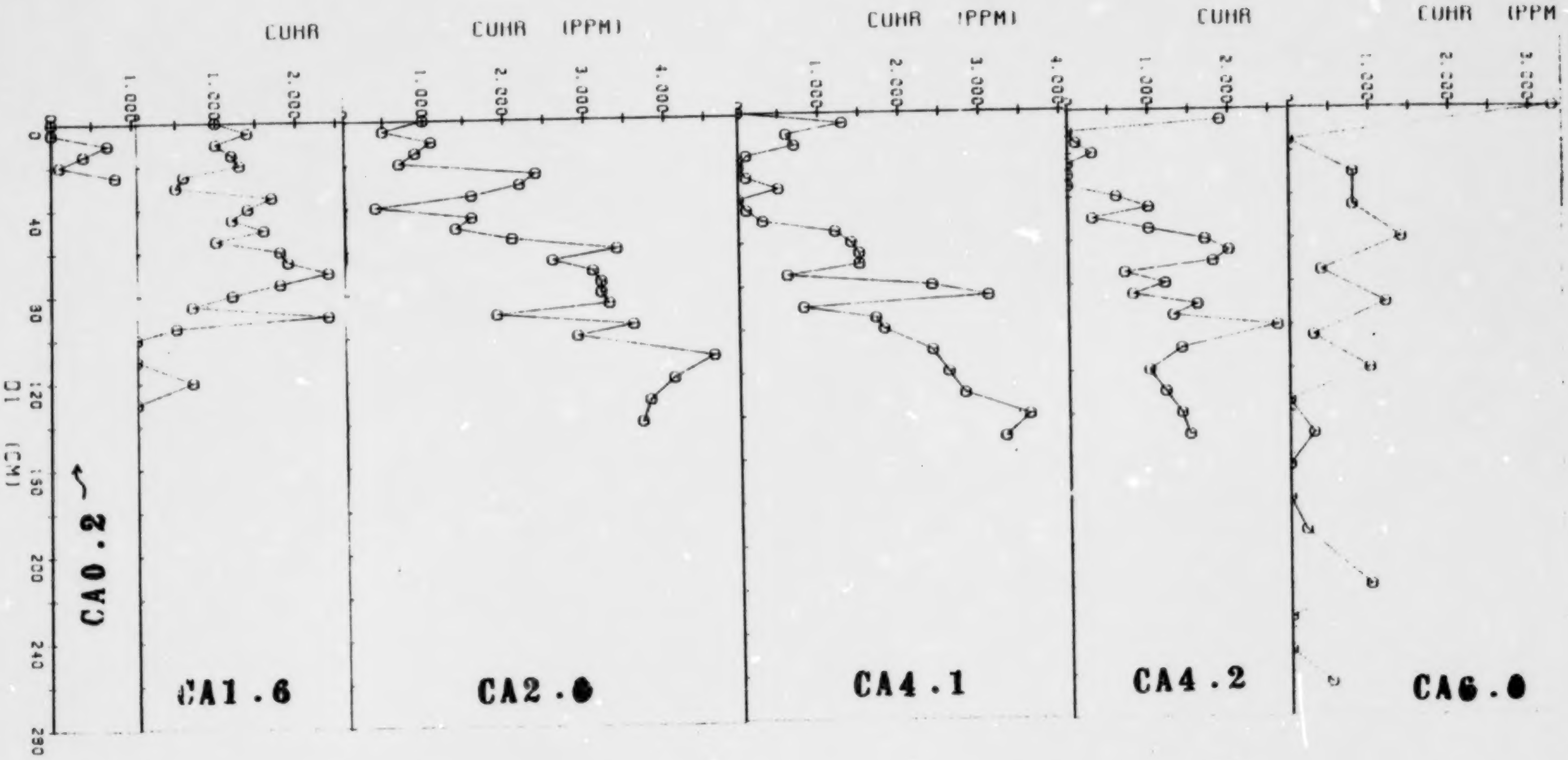


Fig. 10-21A Reducible fraction of Copper in 6 cores from Cambridge Fjord

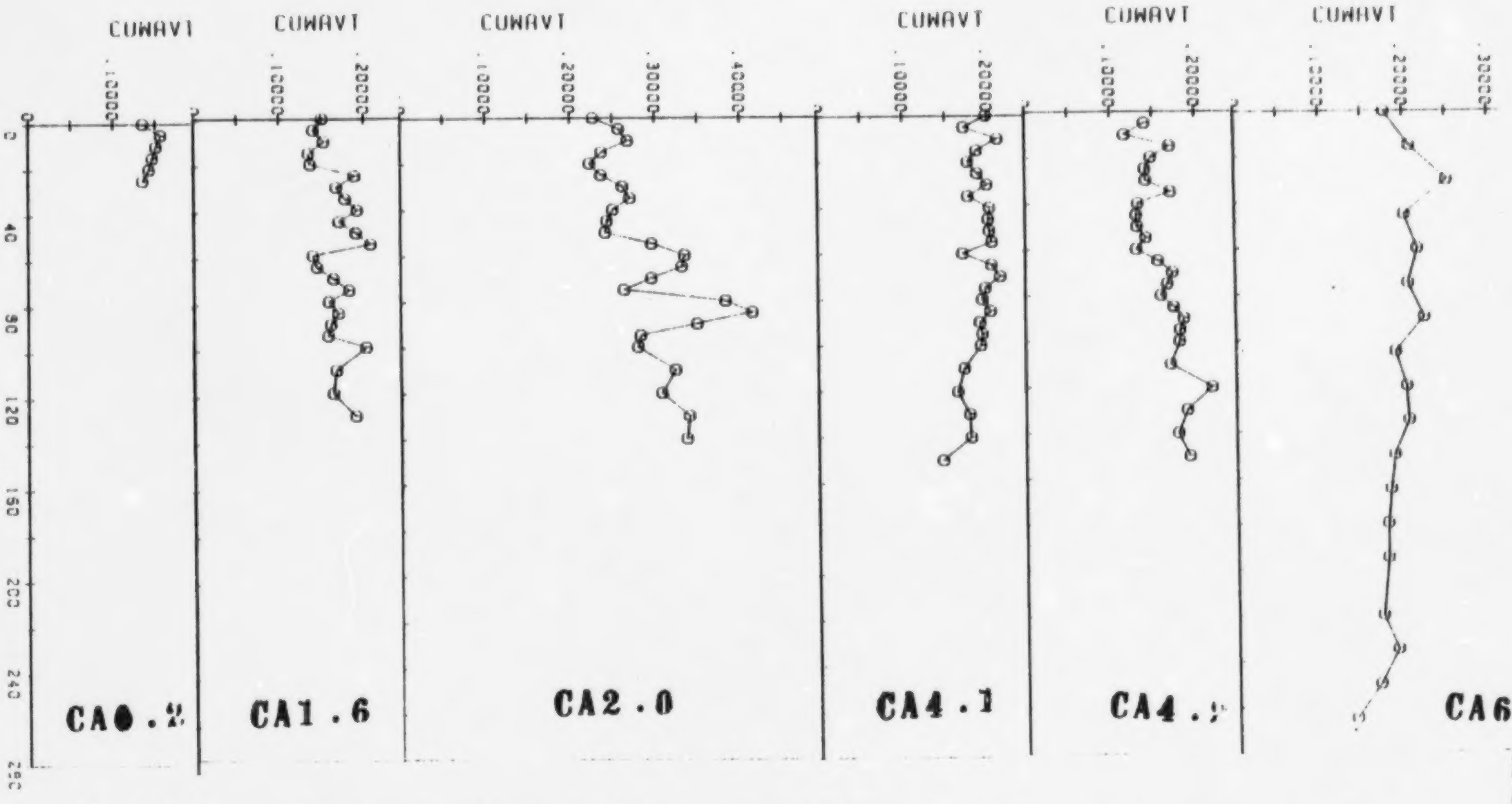


Fig. 10-22A Ratio of weak acid leachable Copper/total Copper in 6 cores from Cambridge Fjord

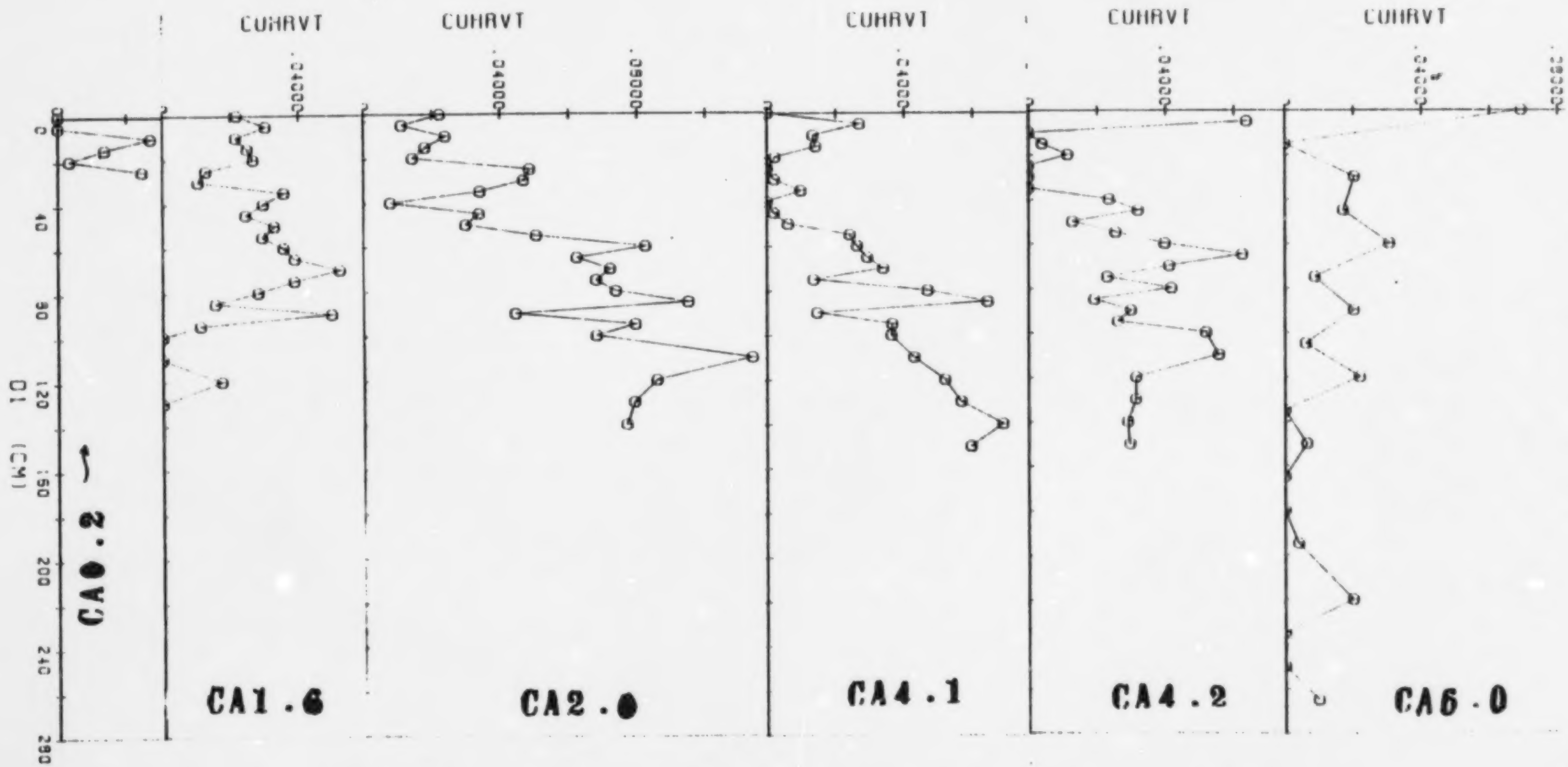


Fig. 10-23A Ratio of reducible Copper/total Copper in 6 cores from Cambridge Fjord

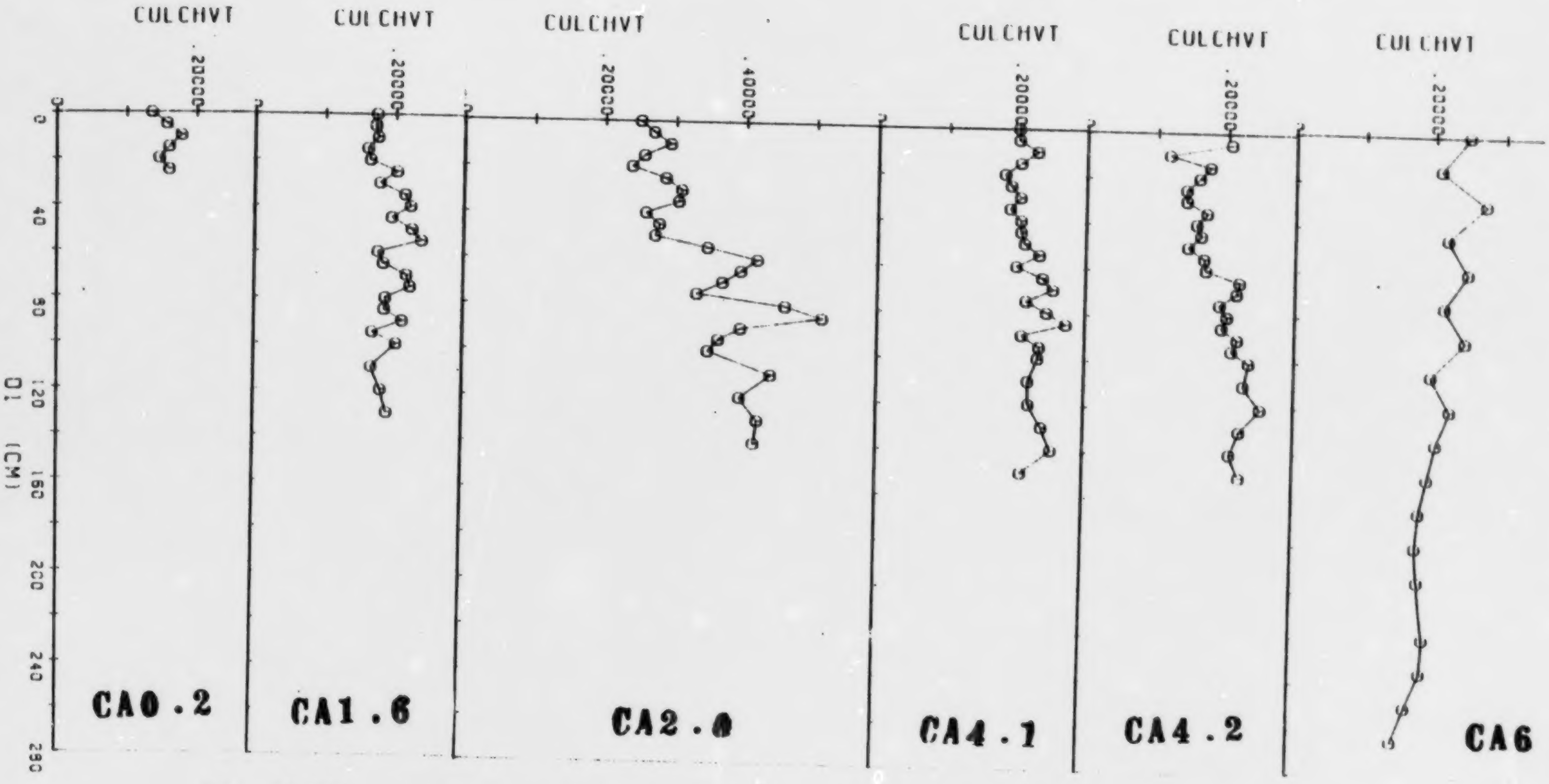


Fig. 10-24A Ratio of labile Copper/total Copper in 6 cores from Cambridge Fjord

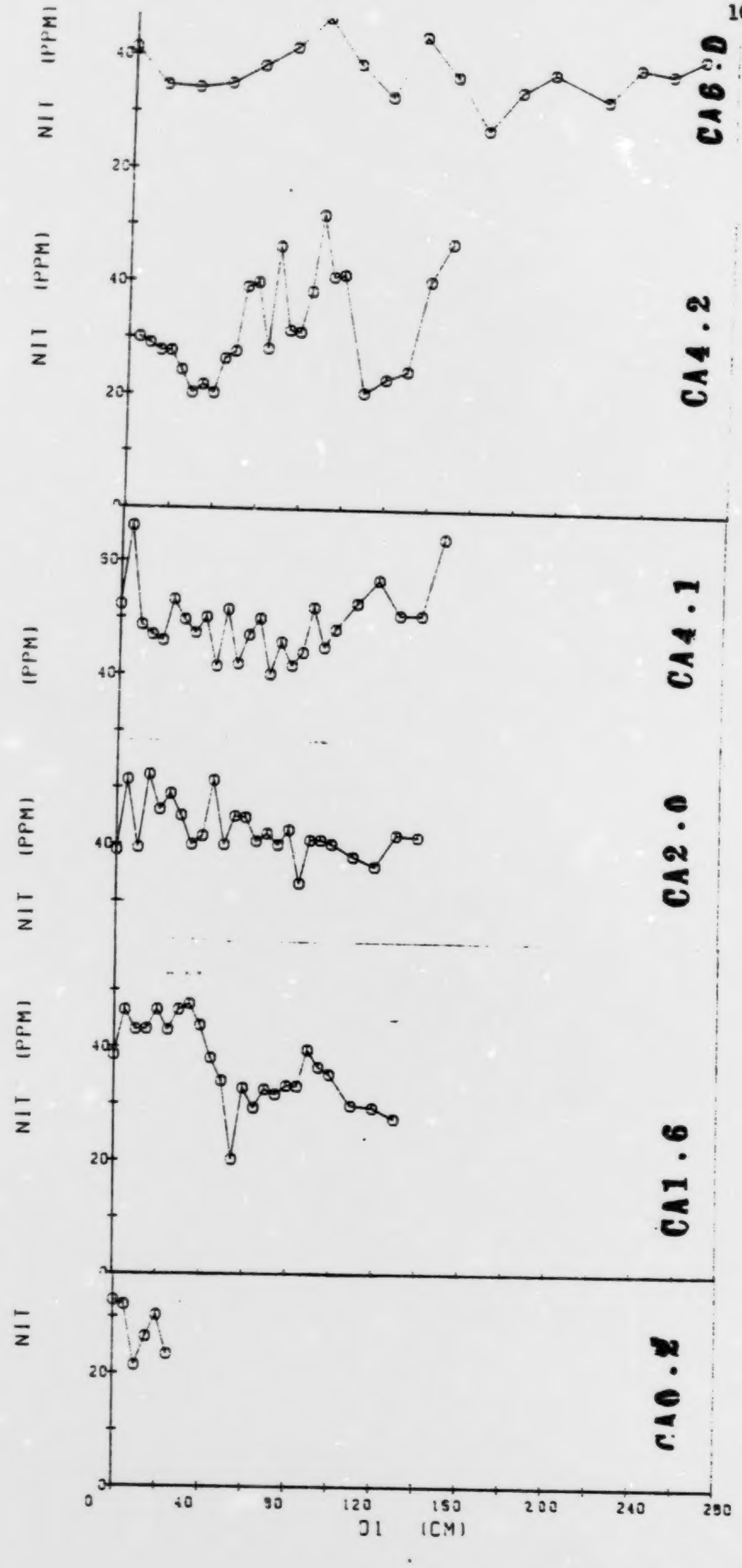


Fig. 10-25A Total Nickel in 6 cores from Cambridge Fjord

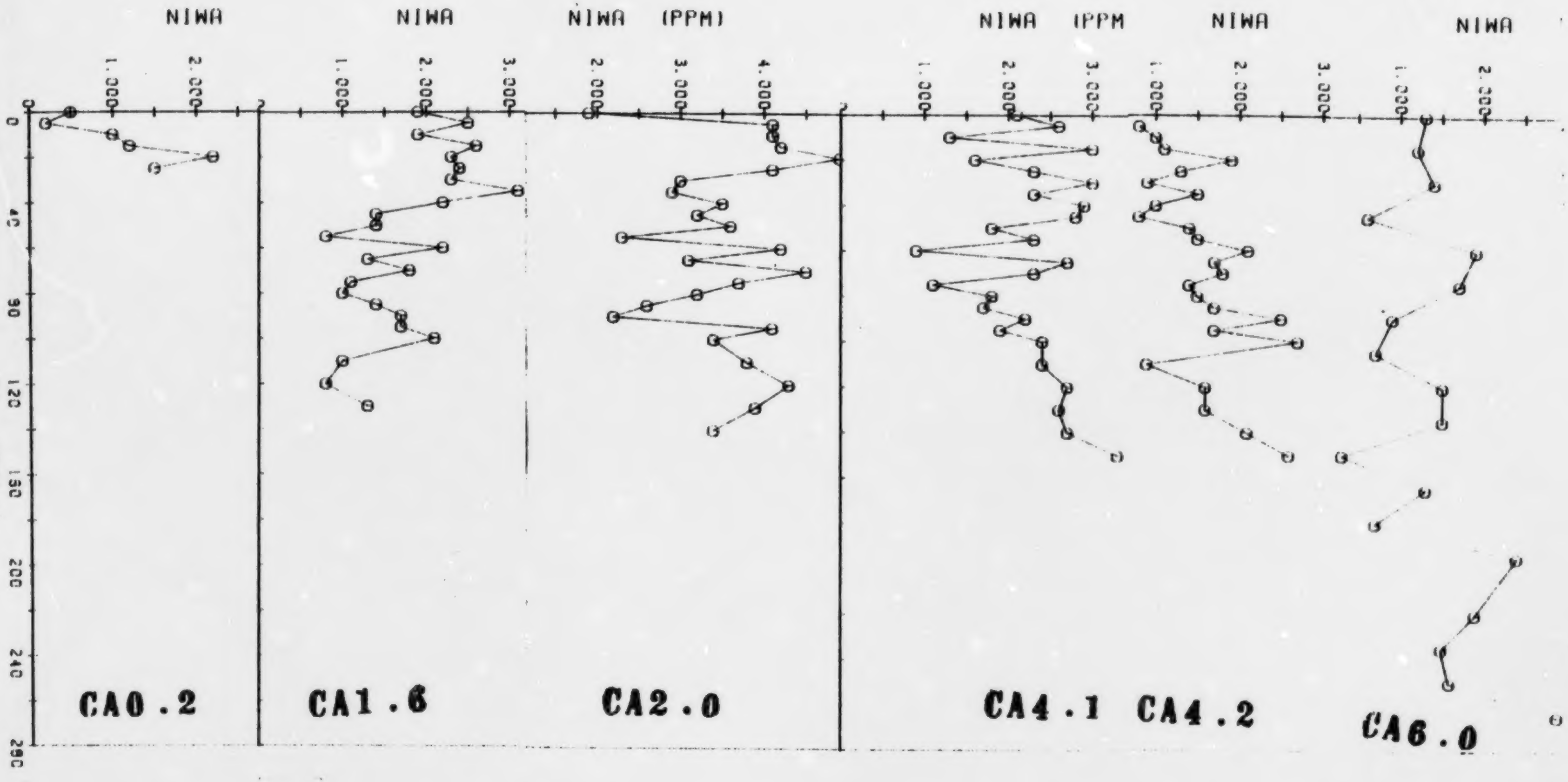


Fig. 10-26A Weak acid leachable Nickel in 6 cores from Cambridge Fjord

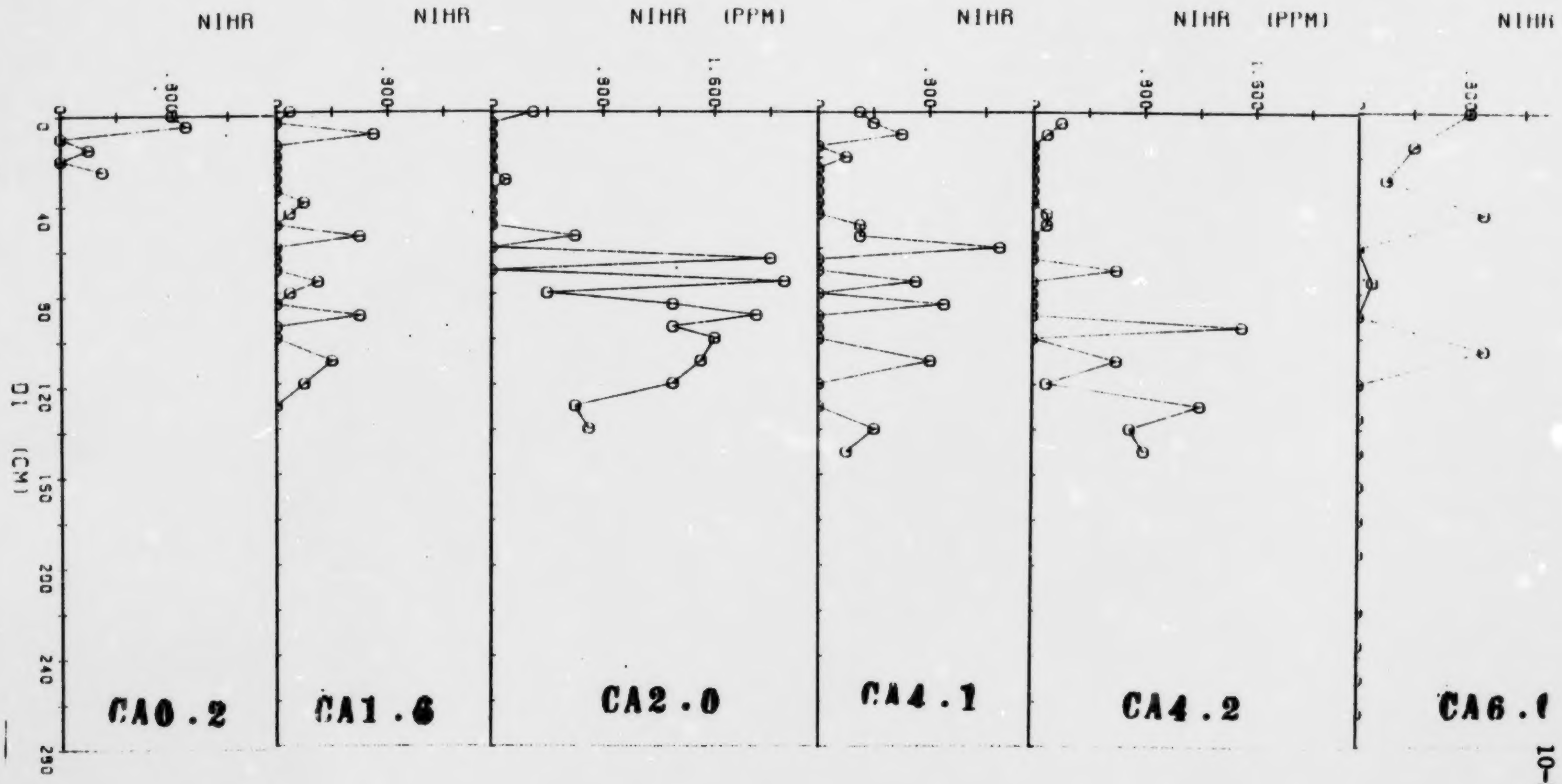


Fig. 10-27A Reducible fraction of Nickel in 76 cores from Cambridge Fjord

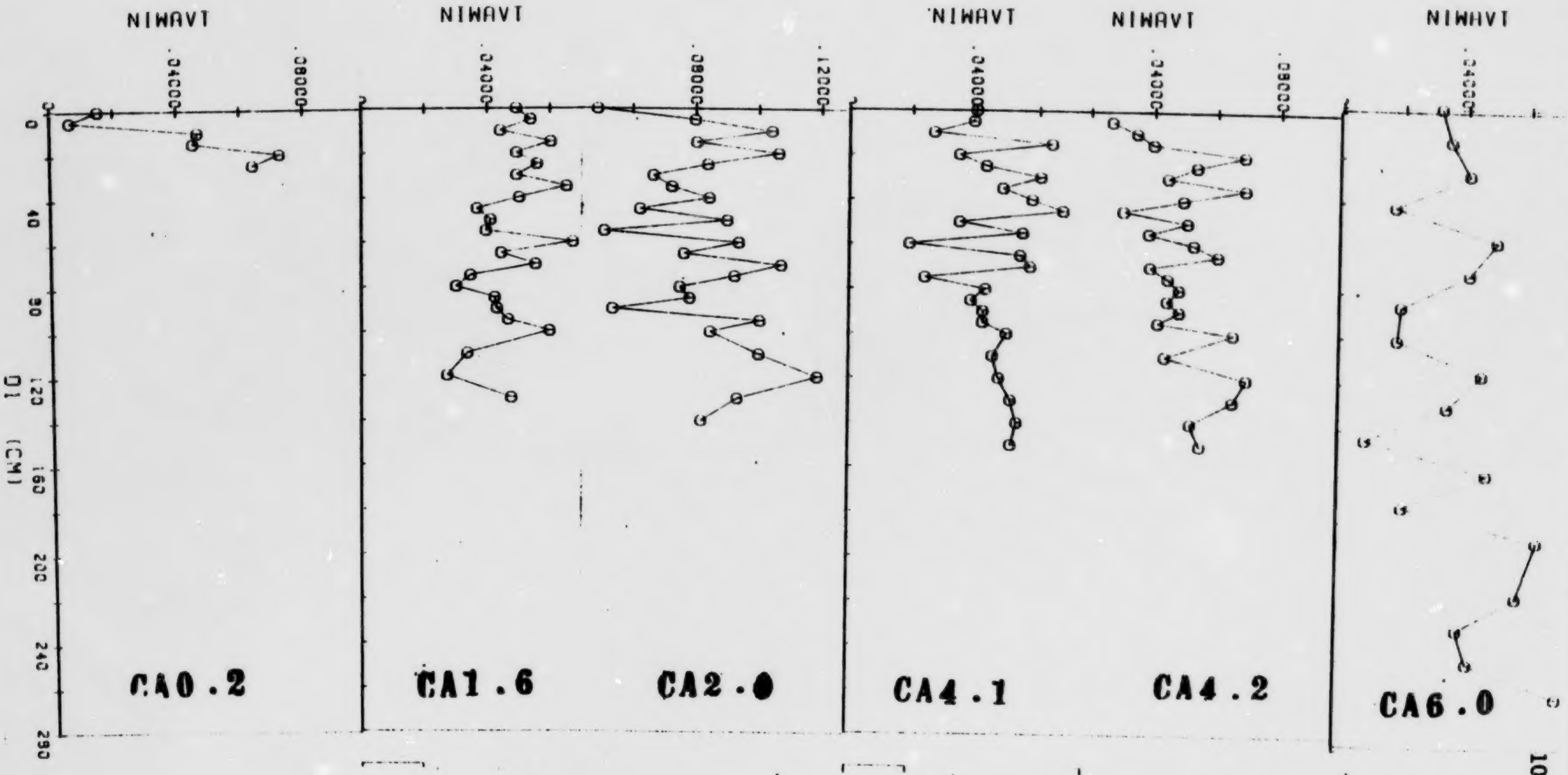


Fig. 10-28A Ratio of weak acid leachable Nickel/total Nickel in 6 cores from Cambridge Fjord

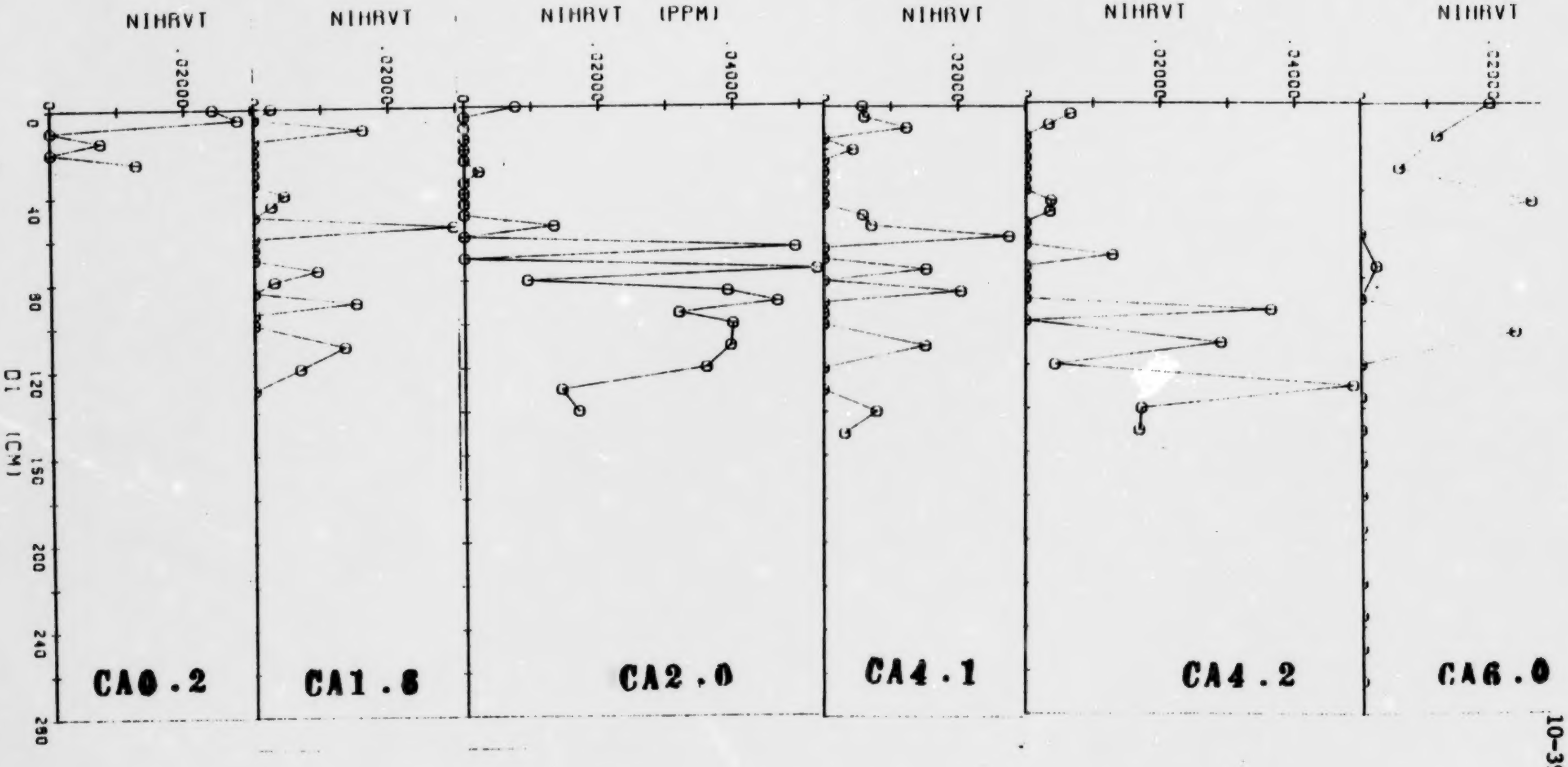


Fig. 10-29A Ratio of reducible Nickel/total Nickel in 6 cores from Cambridge Fjord

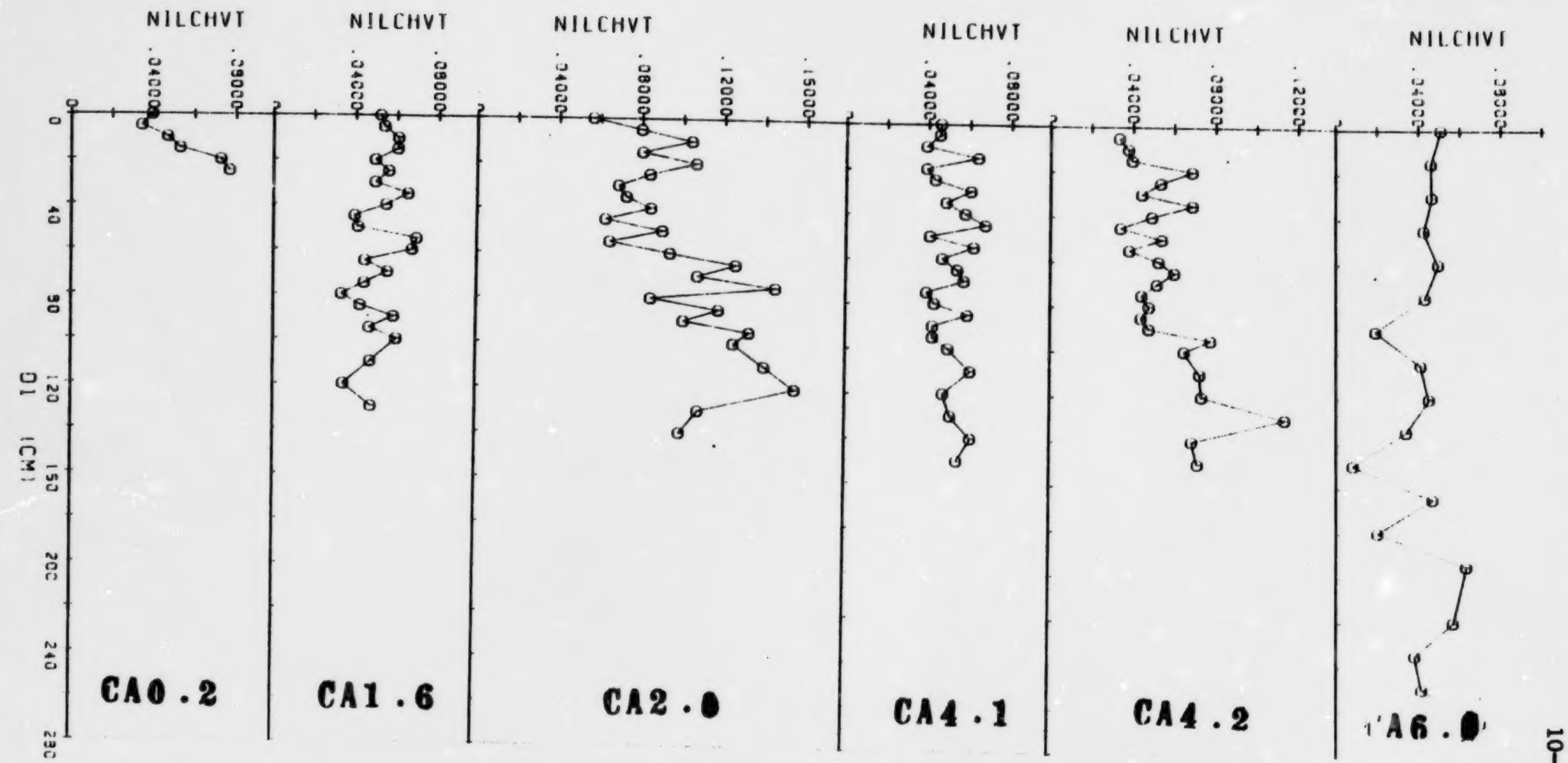


Fig. 10-30A Ratio of labile Nickel/total Nickel in 6 cores from Cambridge Fjord

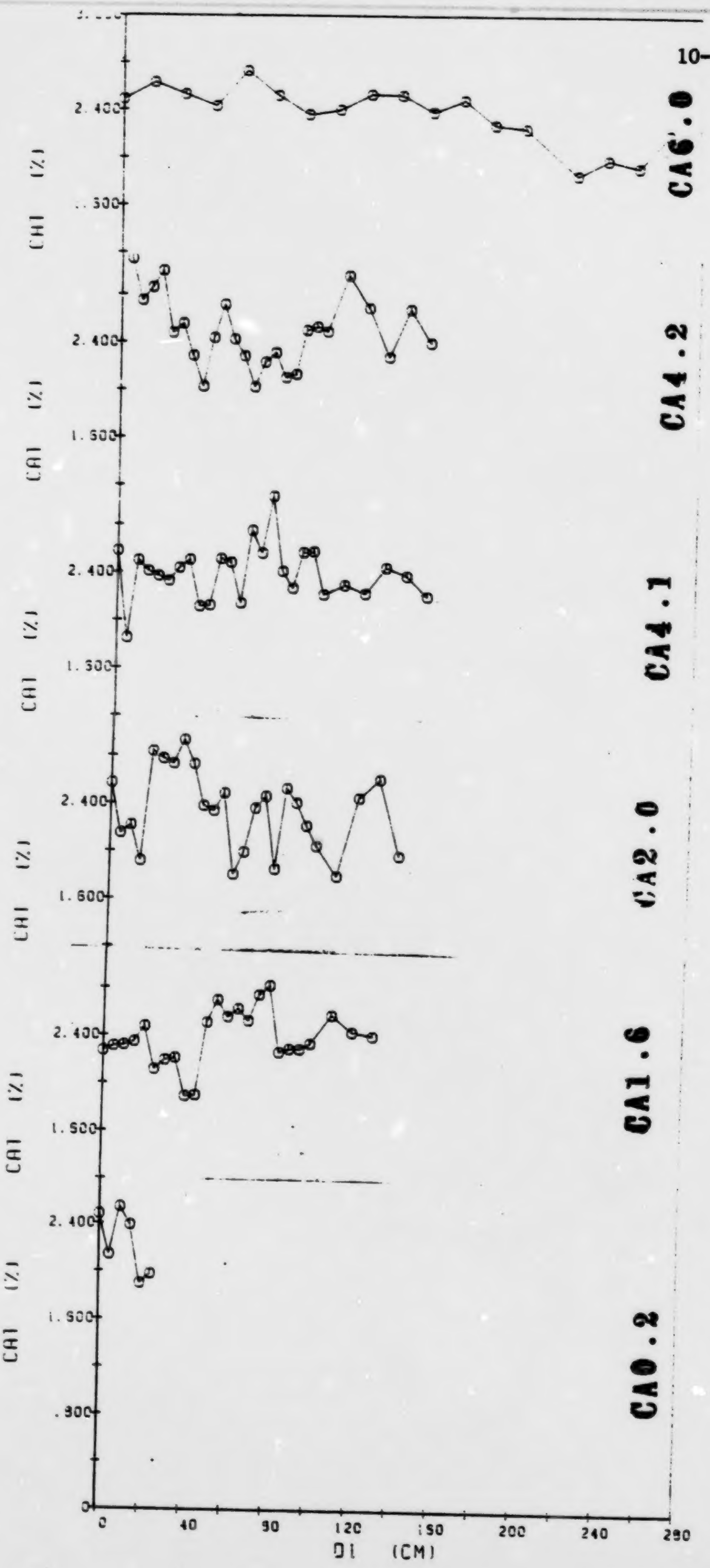


Fig. 10-31A Total Calcium in 6 cores from Cambridge Fjord

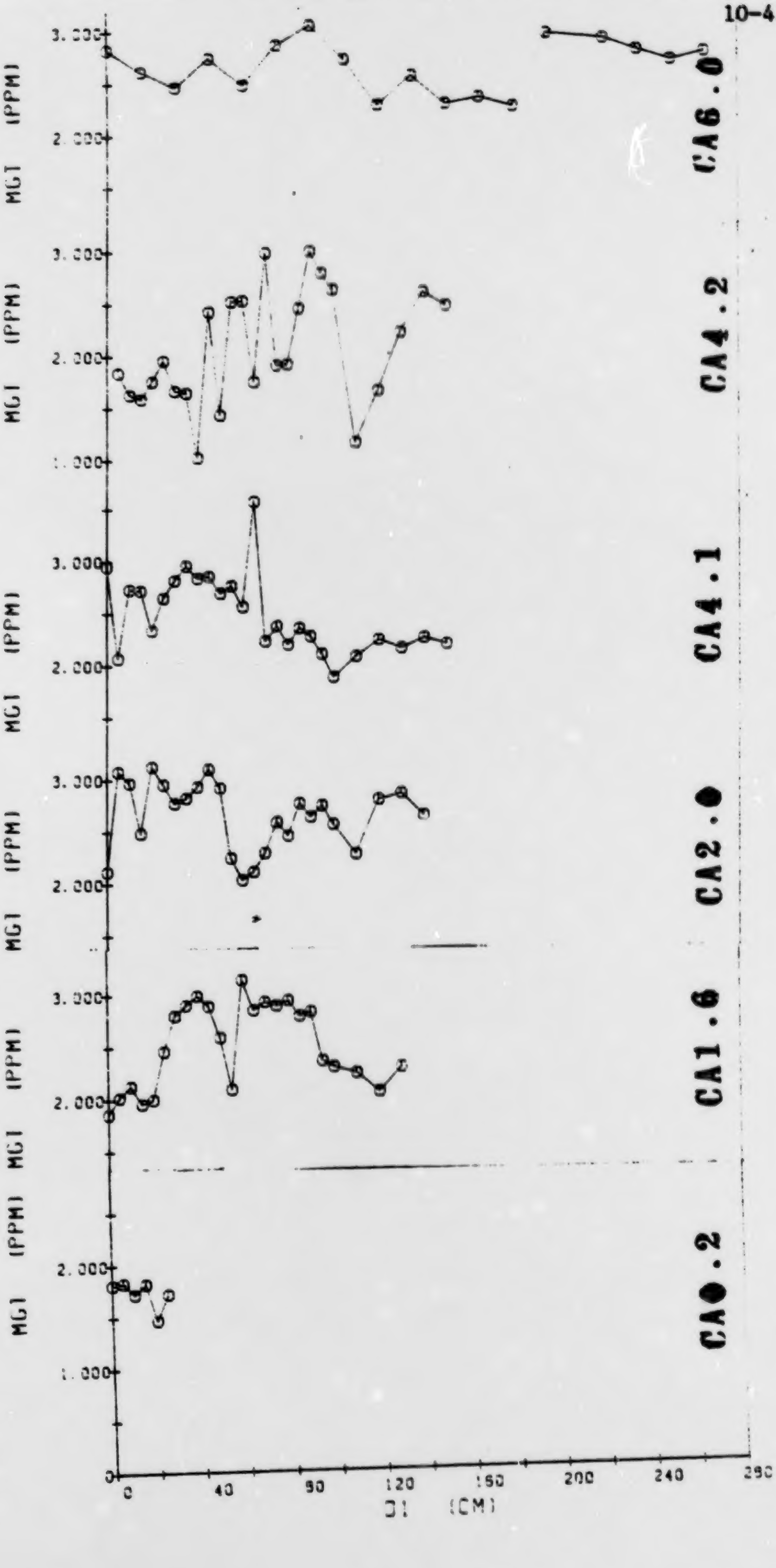


Fig. 10-32A Total Magnesium in 6 cores from Cambridge Fjord

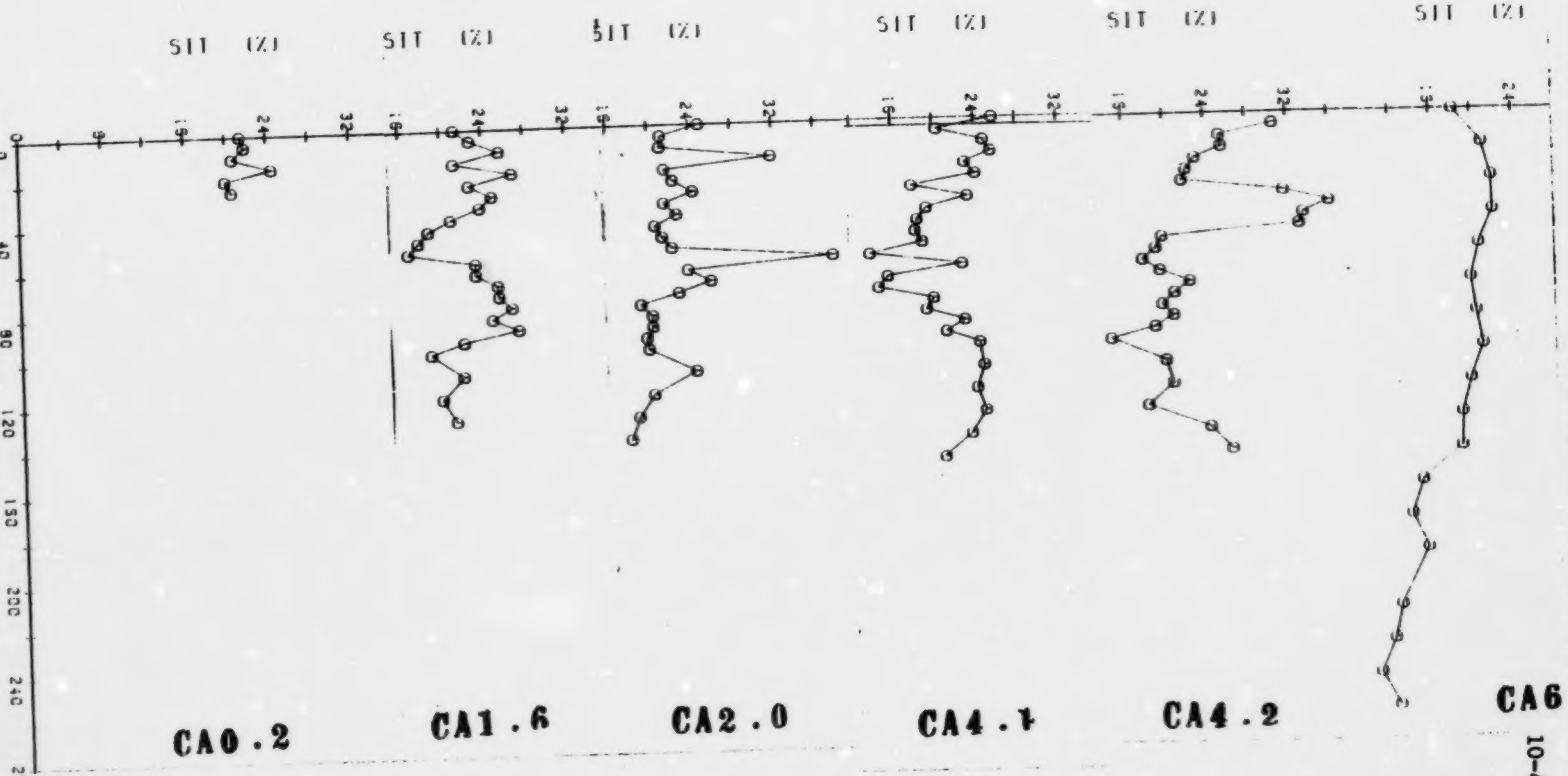


Fig. 10-33A Total Silicon in 6 cores from Cambridge Fjord

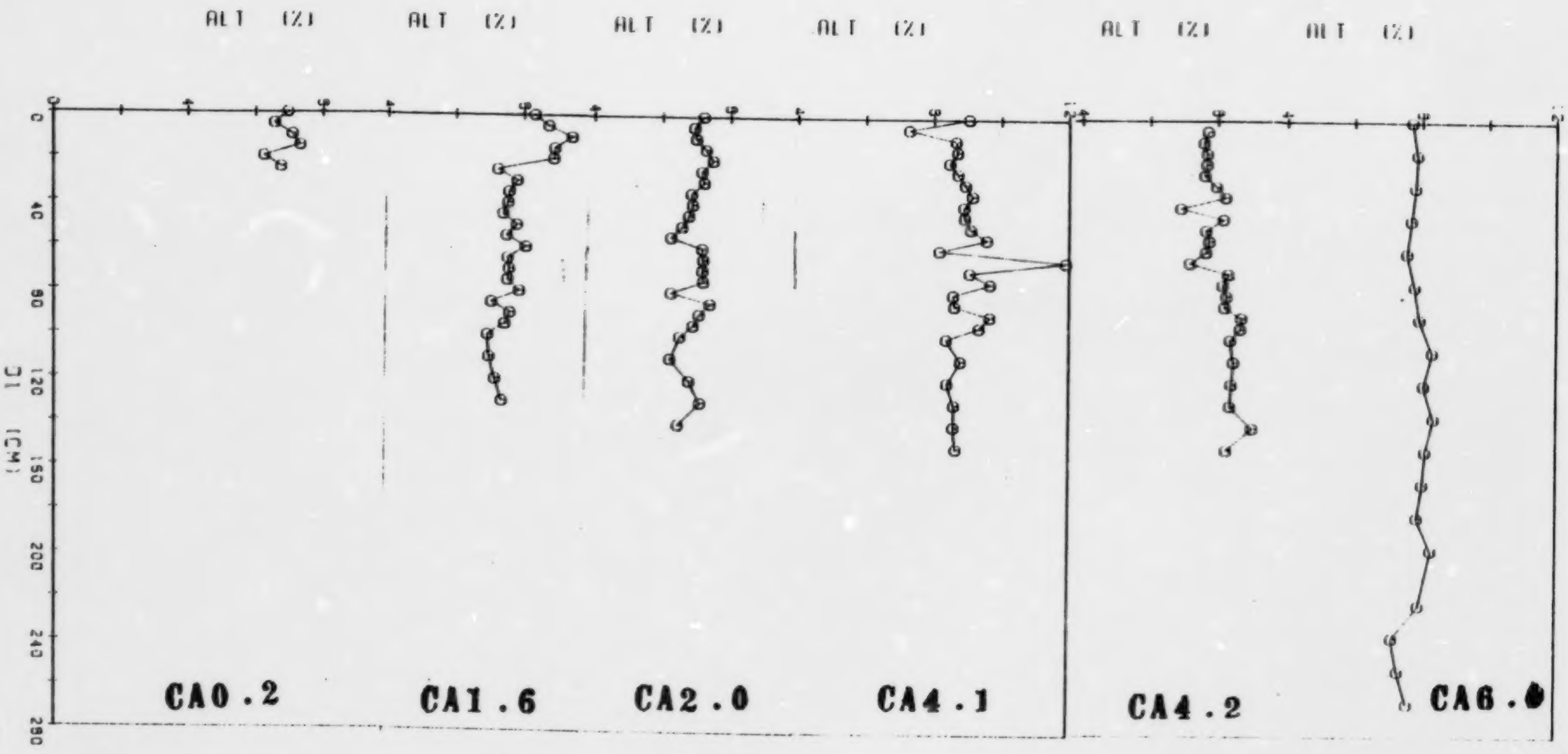


Fig. 10-34A Total Aluminum in 7 cores from Cambridge Fjord

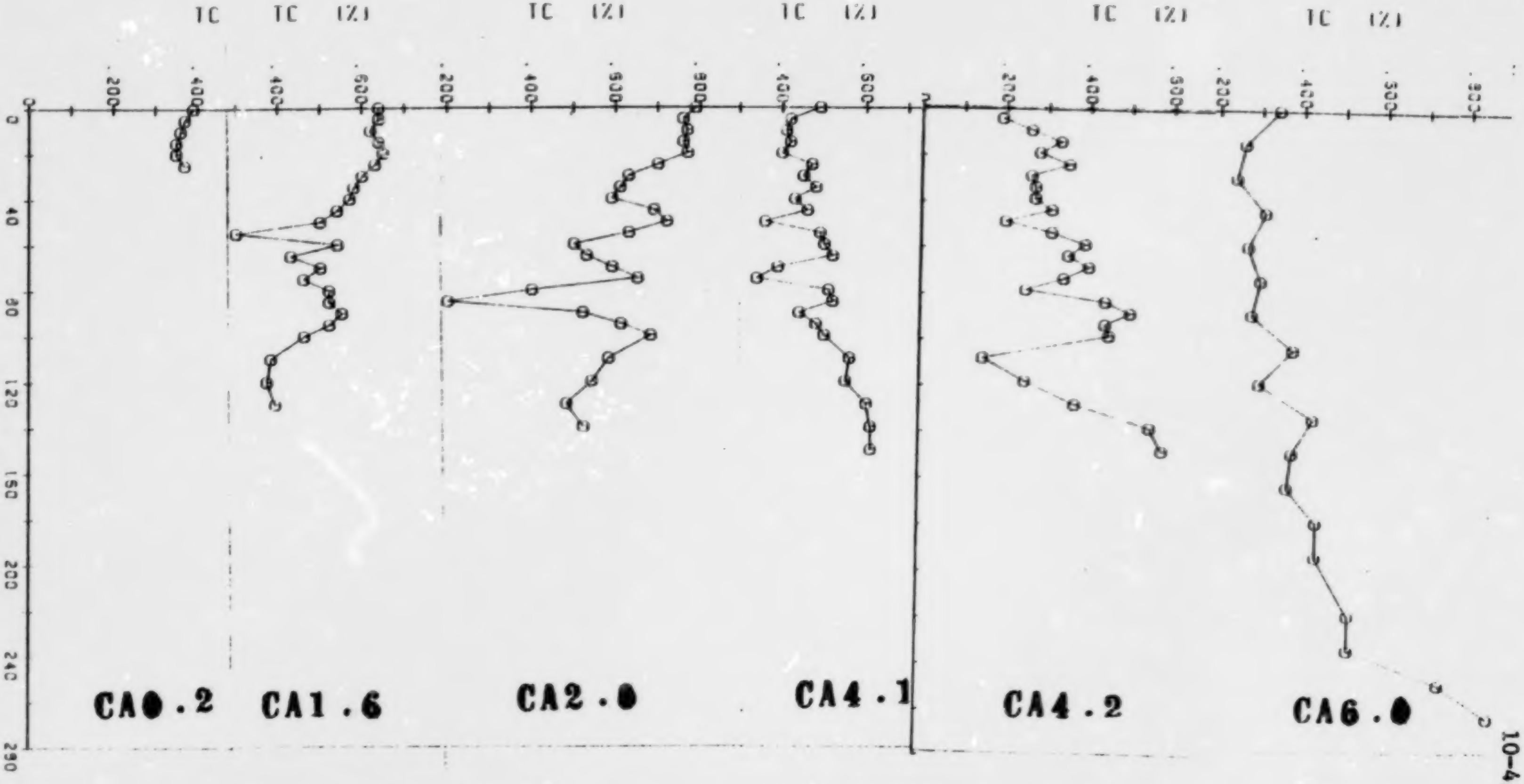


Fig. 10-35A Total Carbon in 6 cores from Cambridge Fjord

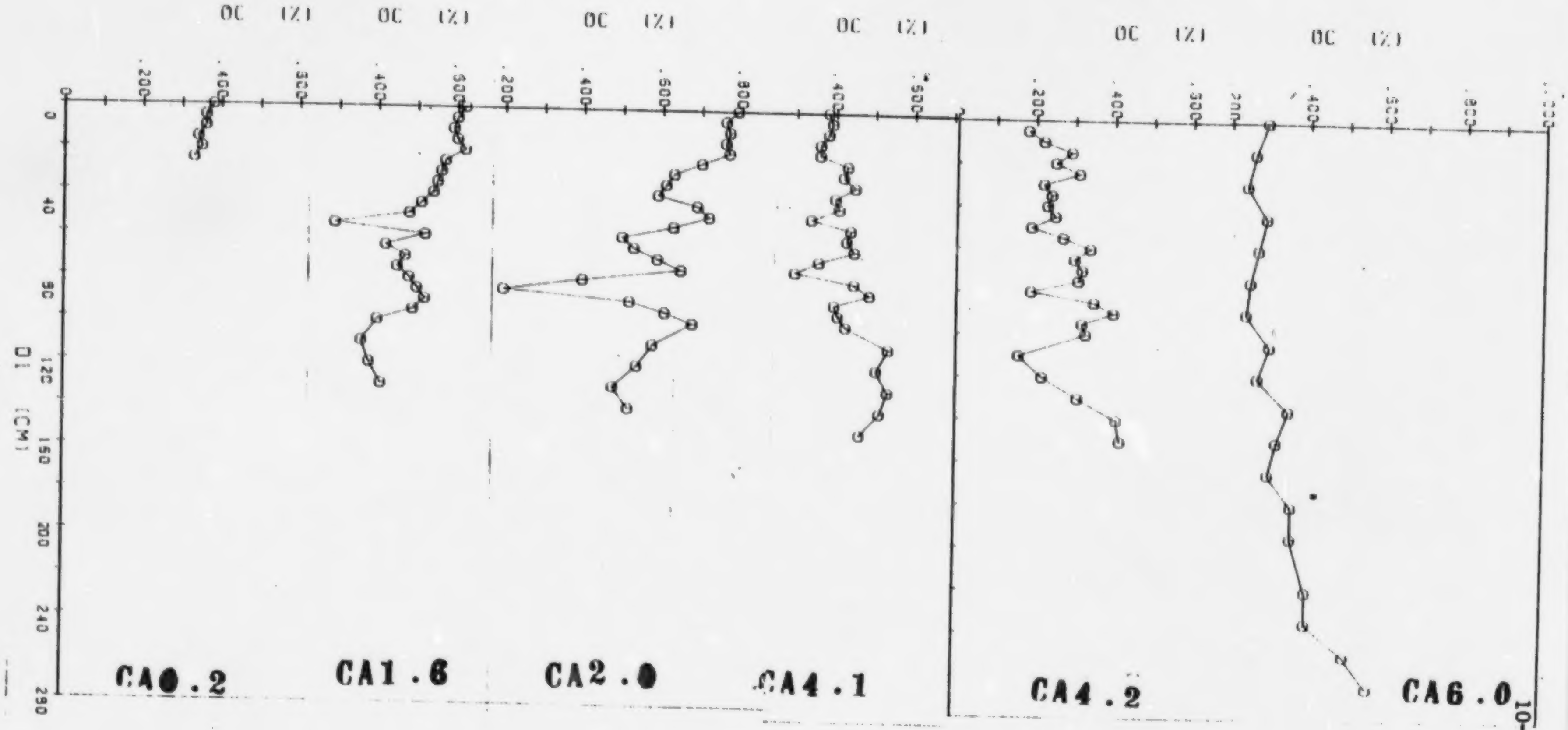


Fig. 10-36A Total organic Carbon in 6 cores from Cambridge Fjord

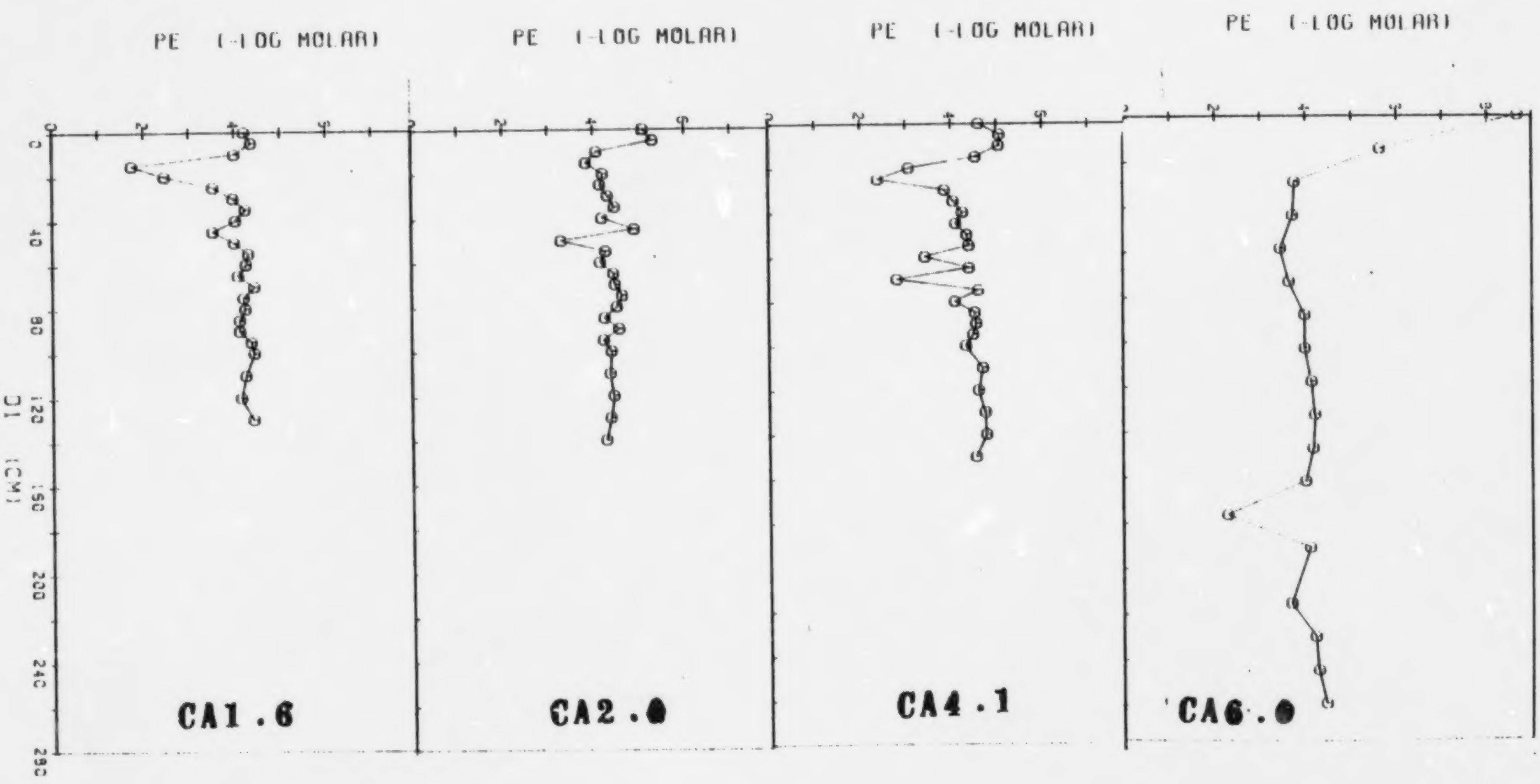


Fig. 10-37A Redox potential (oxidation/reduction potential) in 6 cores from Cambridge Fjord

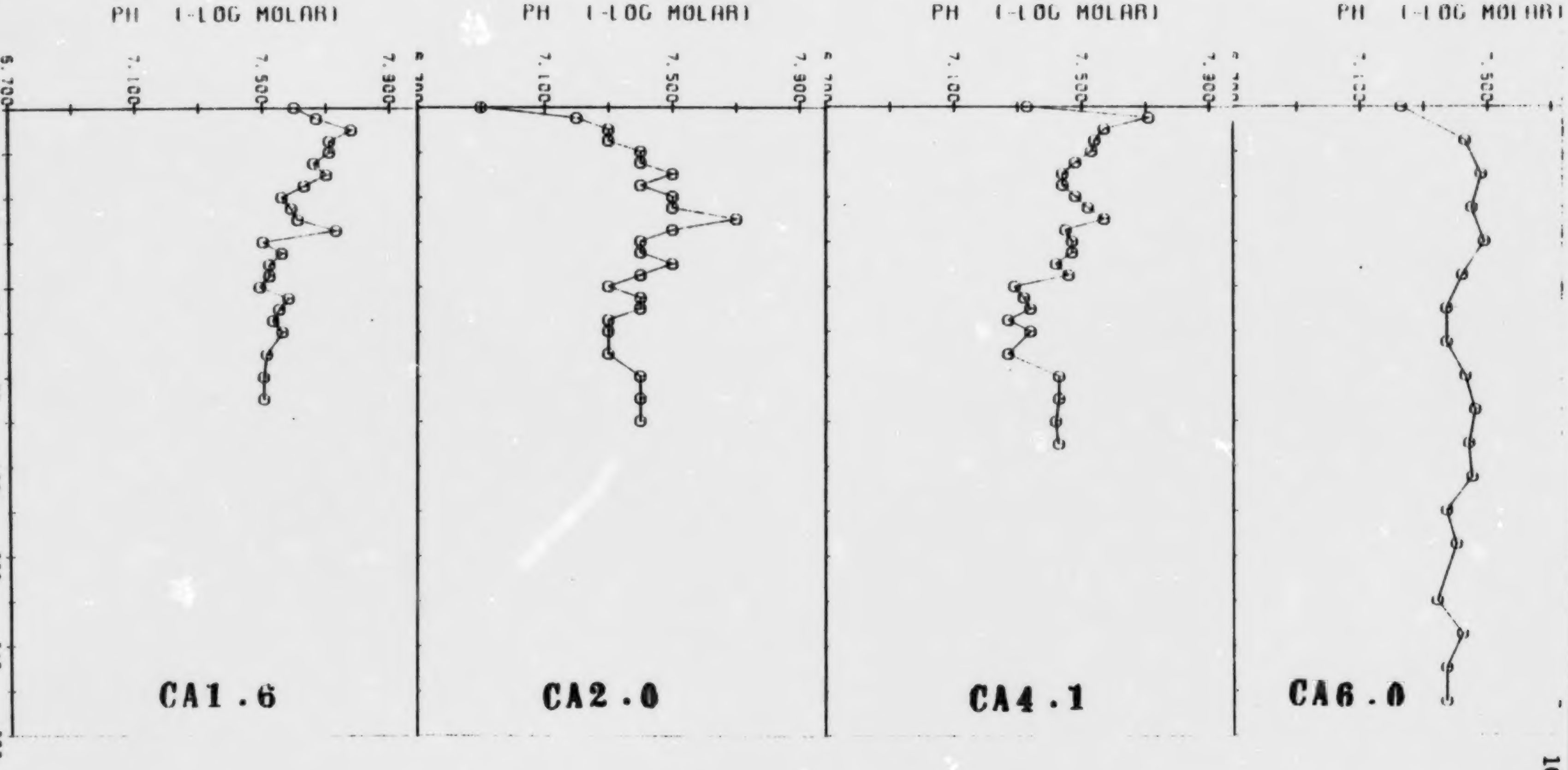


Fig. 10-38A pH (hydrogen ion) in 6 cores from Cambridge Fjord

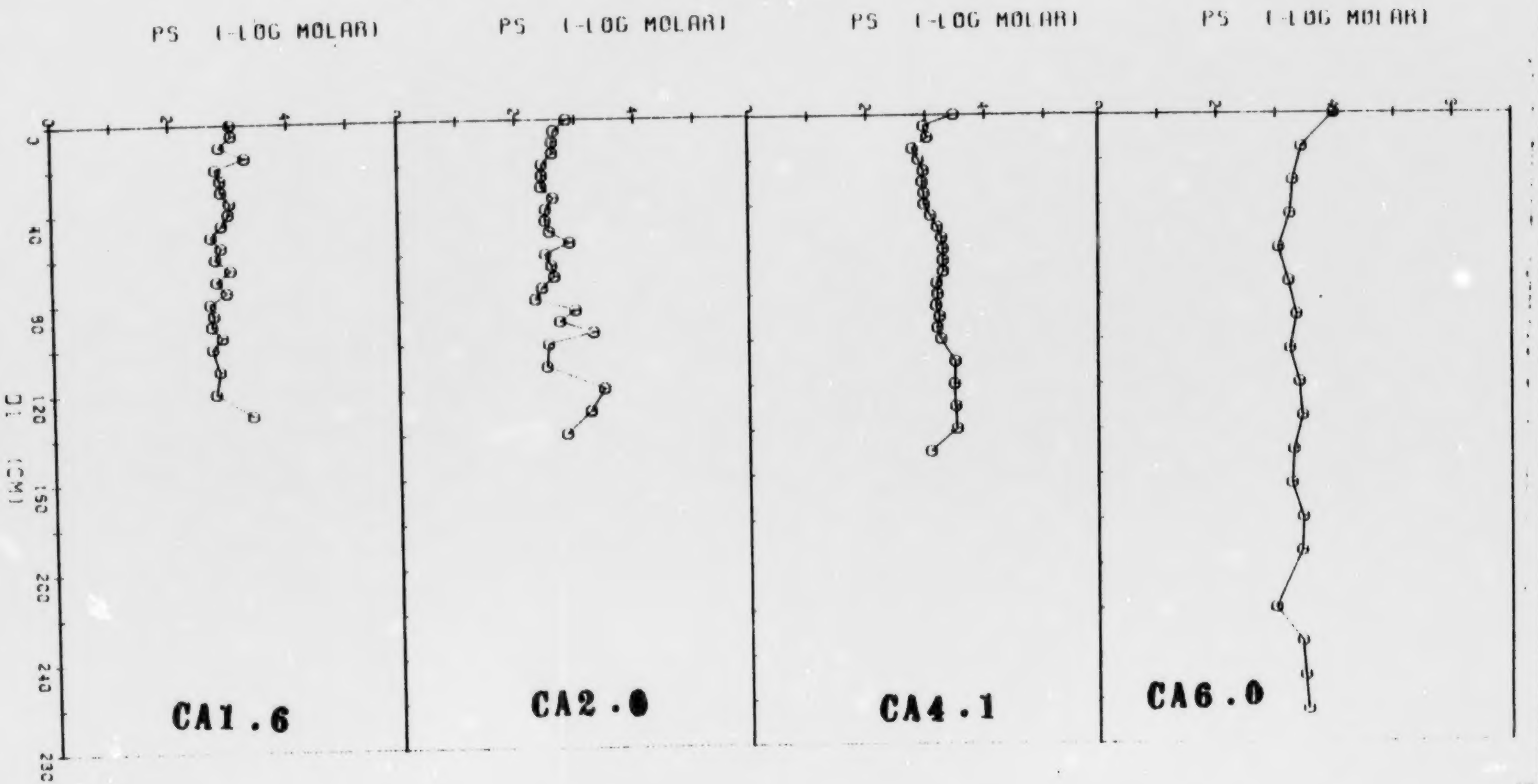


Fig. 10-39A pS (Sulfide ion) in 6 cores from Cambridge Fjord

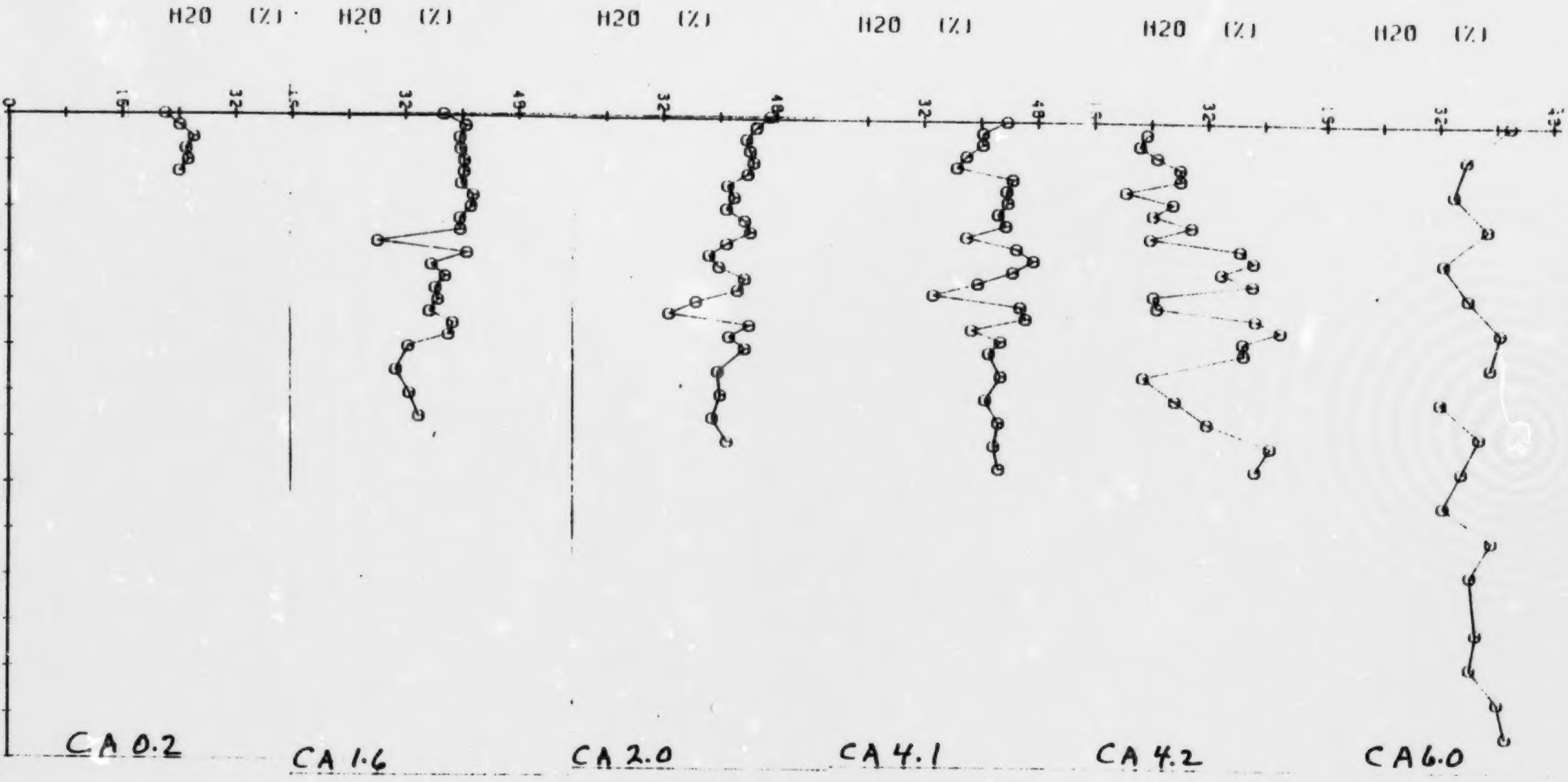


Fig. 10-40A Moisture content in 6 cores from Cambridge Fjord

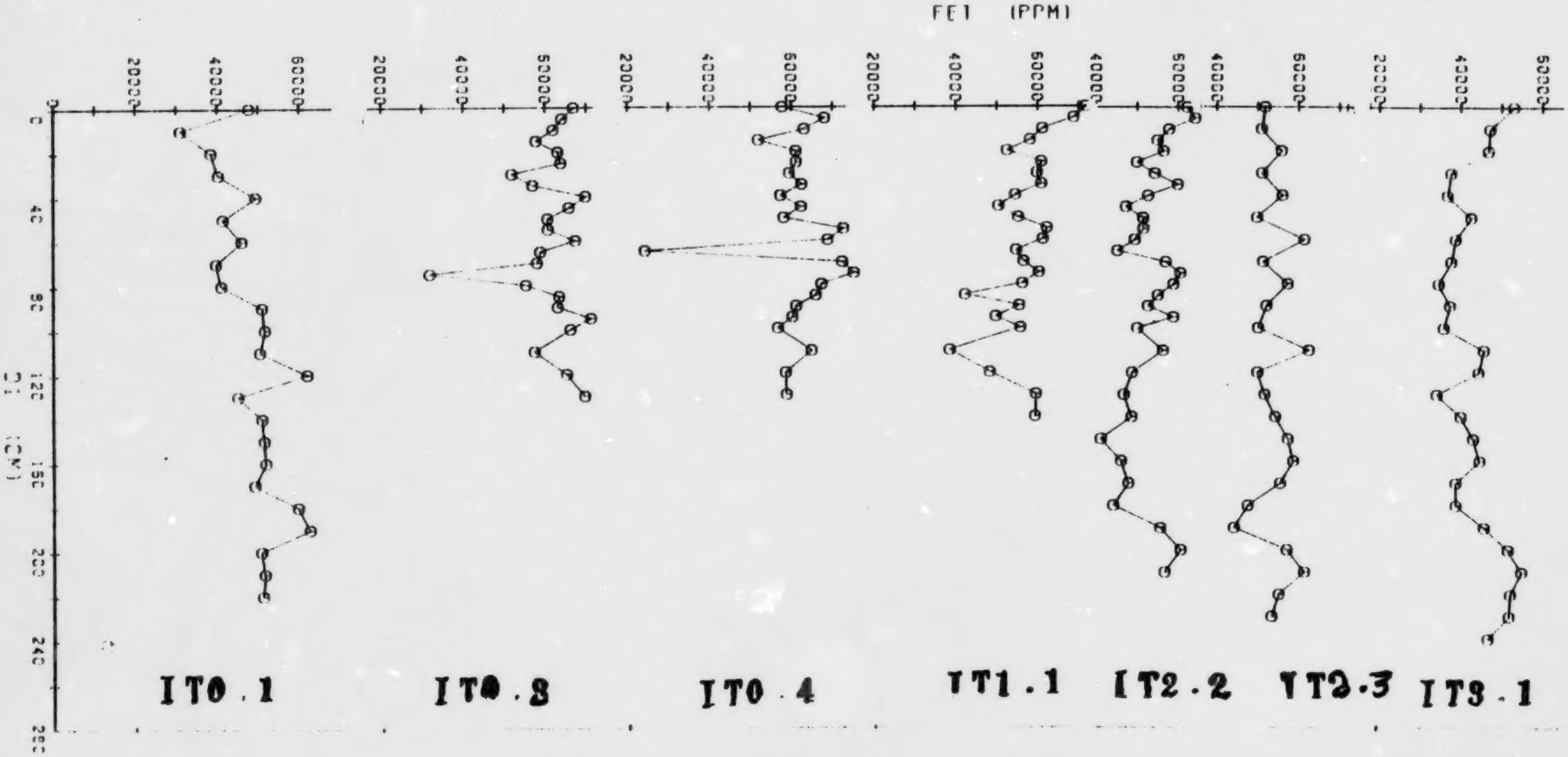


Fig. 10-1B. Total Iron in 7 cores from Itirbilung Fjord

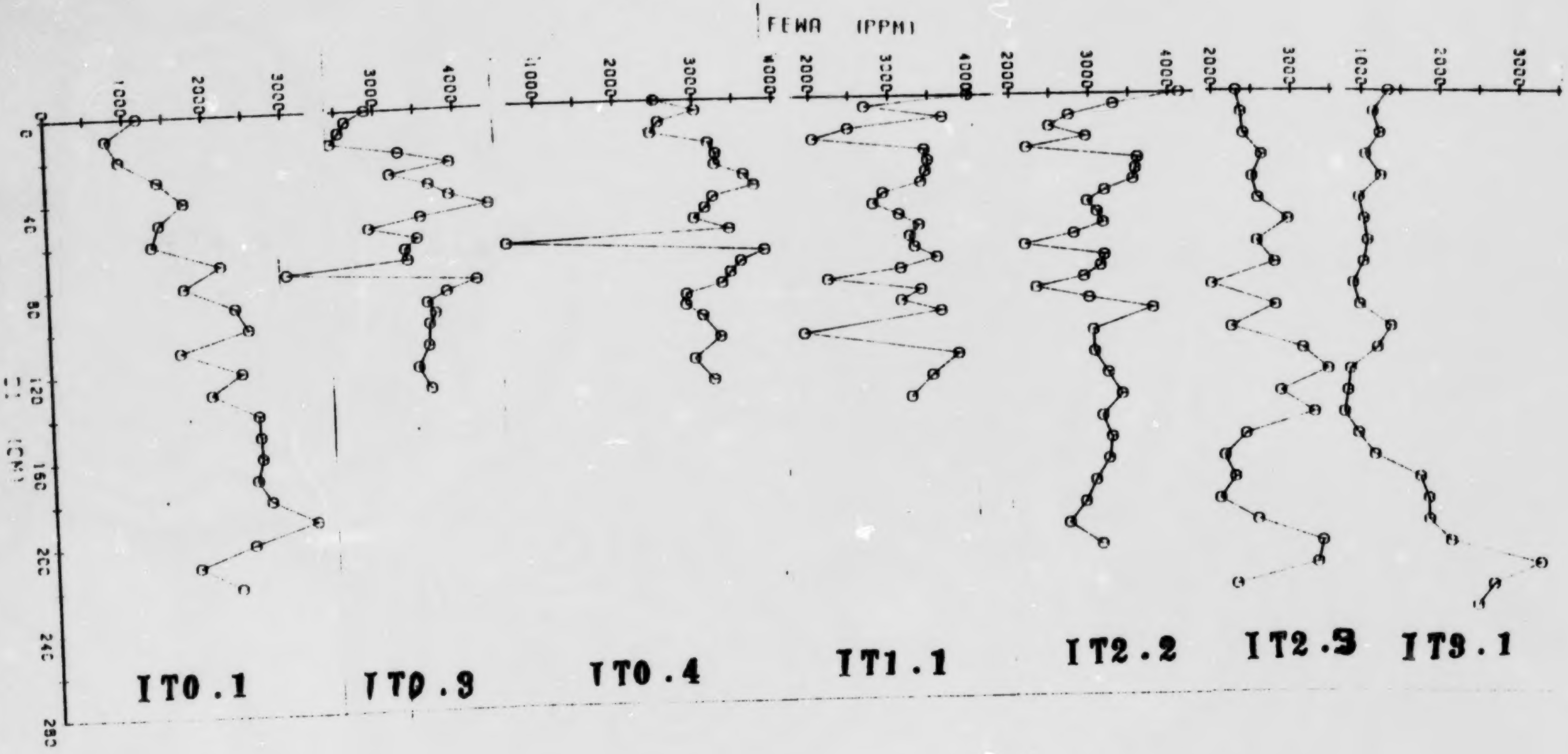


Fig. 10-2B. Weak acid leachable Iron in 7 cores from Itirbilung Fjord

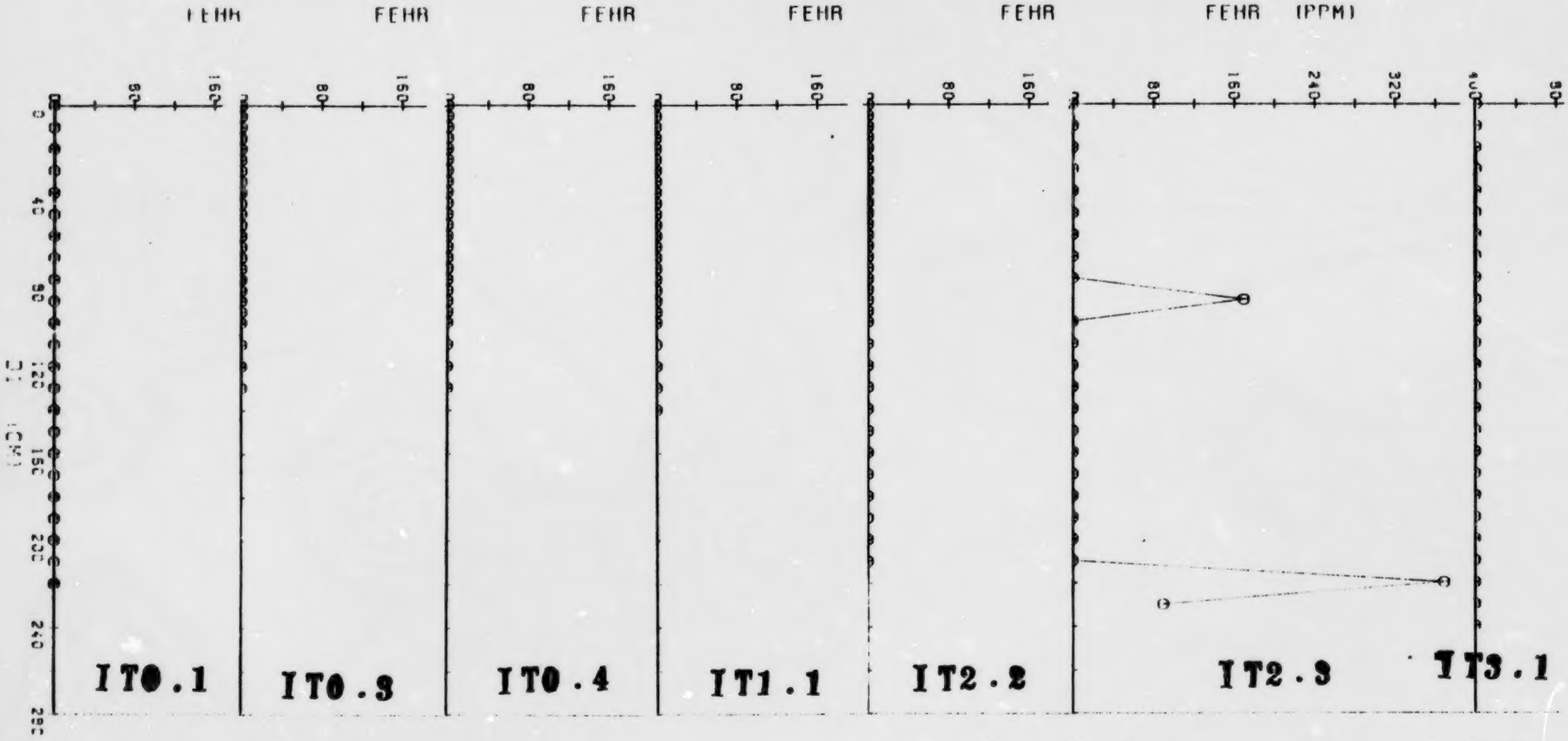


Fig. 10-3B. Reducible fraction of Iron in 7 cores from Itirbilung Fjord

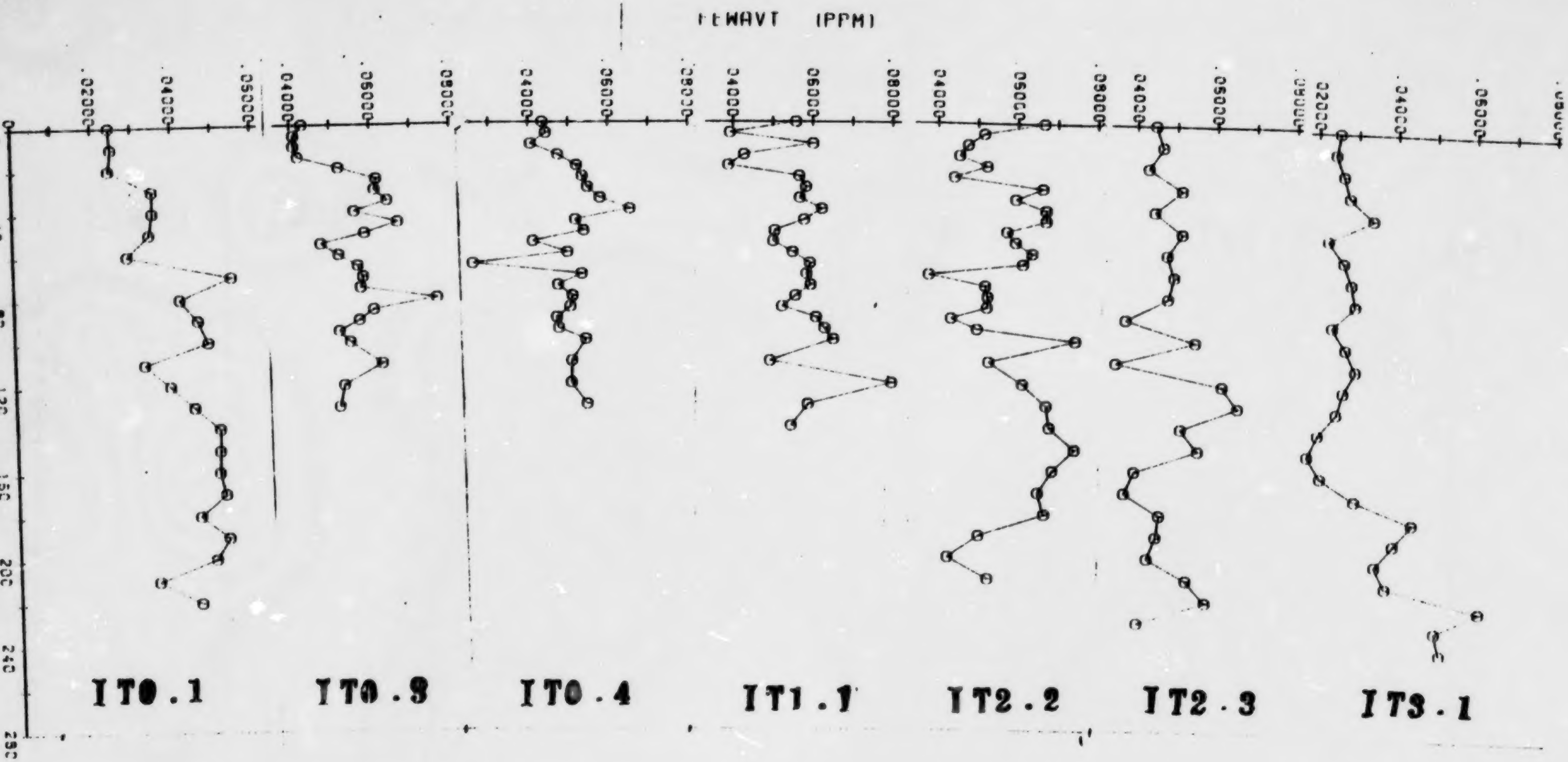


Fig. 10-4B. Ratio of weak acid leachable Iron/total Iron in 7 cores from Itirbilung Fjord

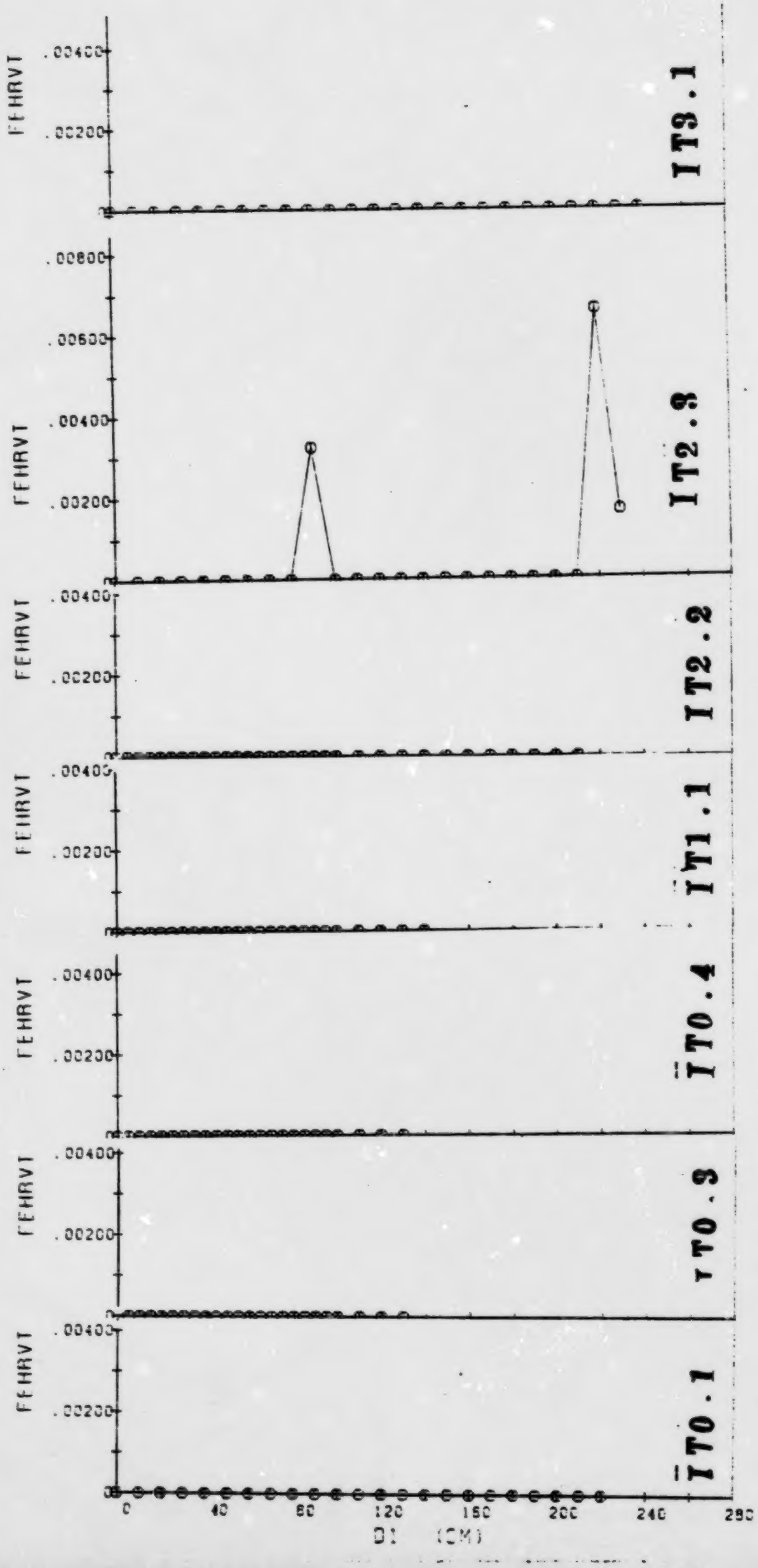


Fig. 10-5B. Ratio of reducible Iron/total Iron in 7 cores from Itirbilung Fjord

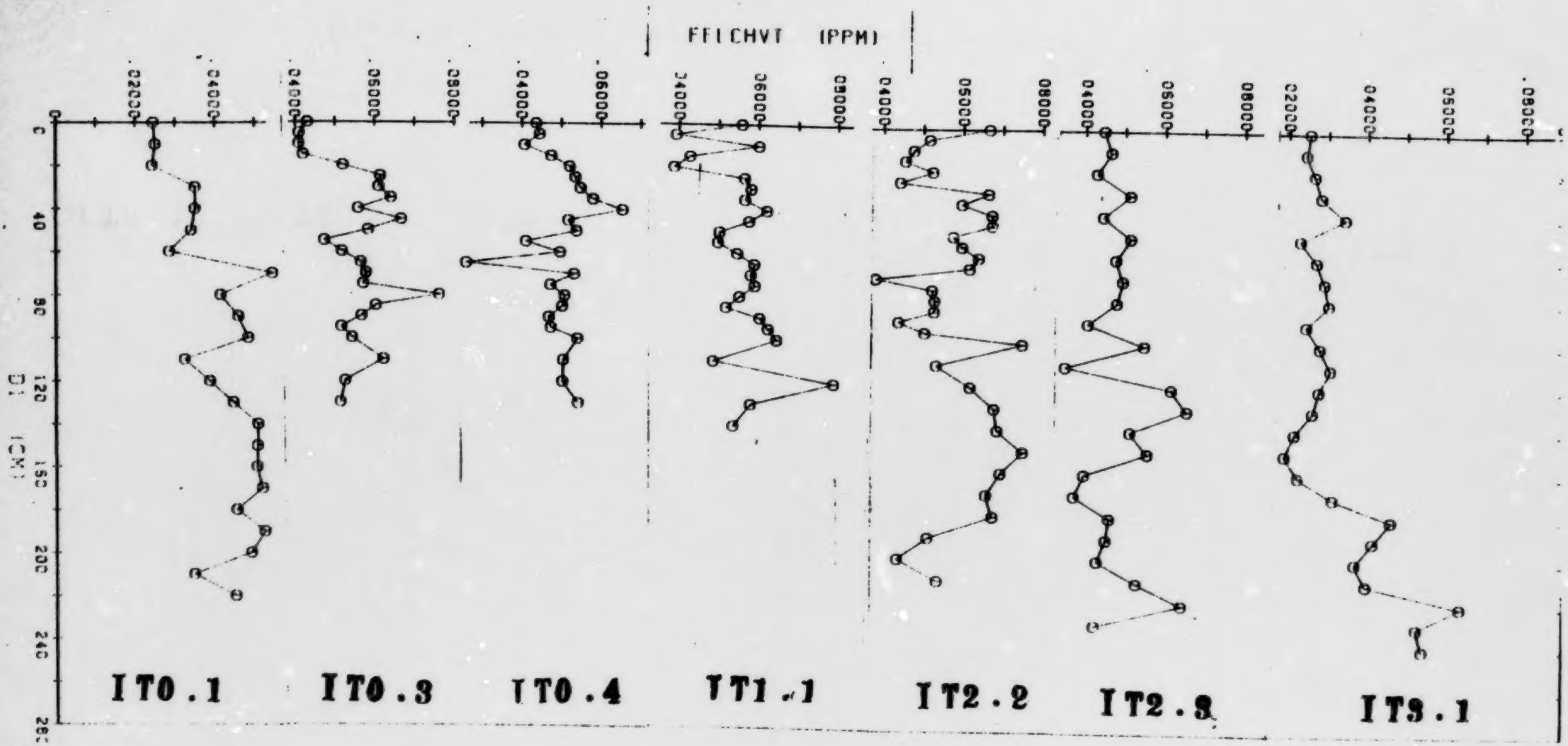


Fig. 10-6B. Ratio of Labile Iron/total Iron in 7 cores from Itirbilung Fjord

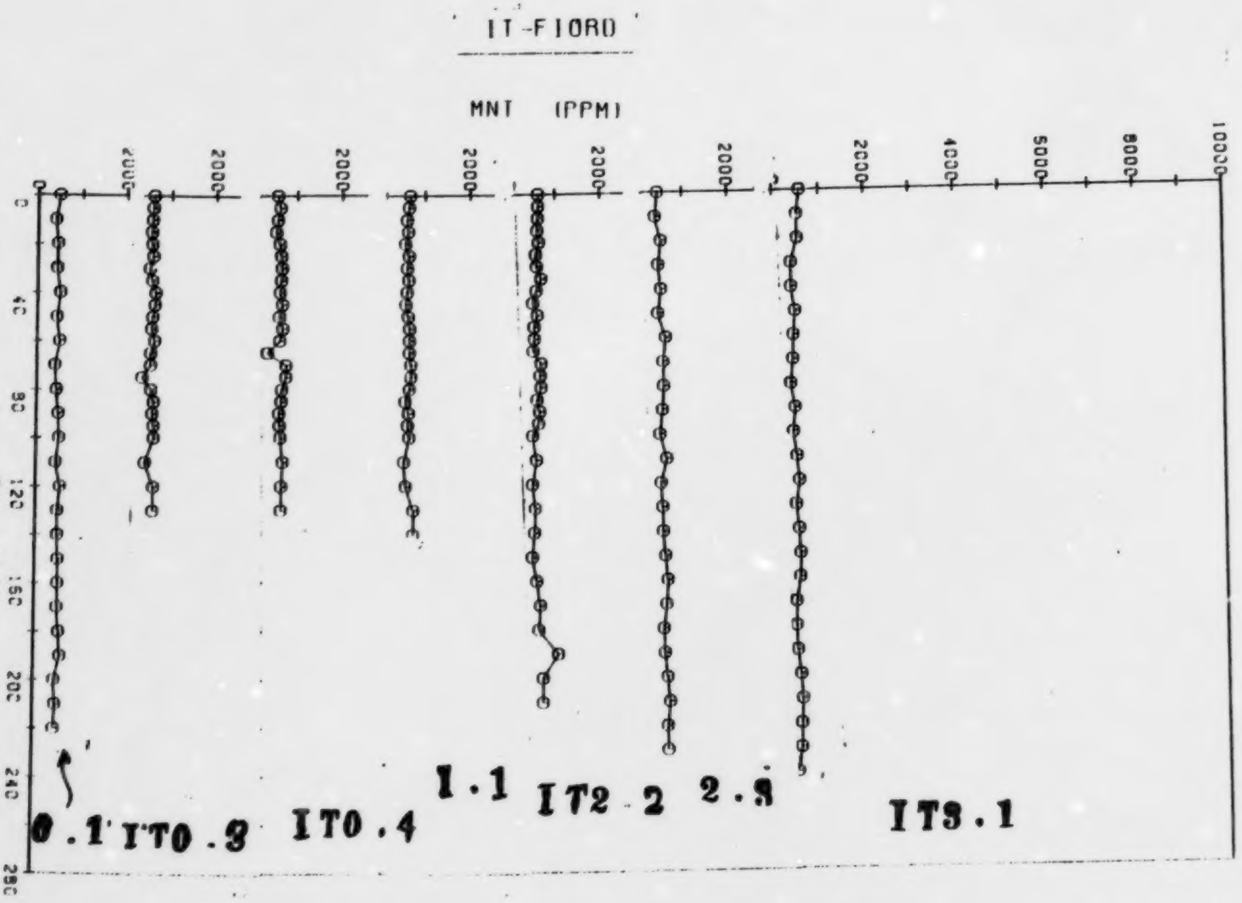


Fig. 10-7B. Total Manganese in 7 cores from Itirbilung Fjord

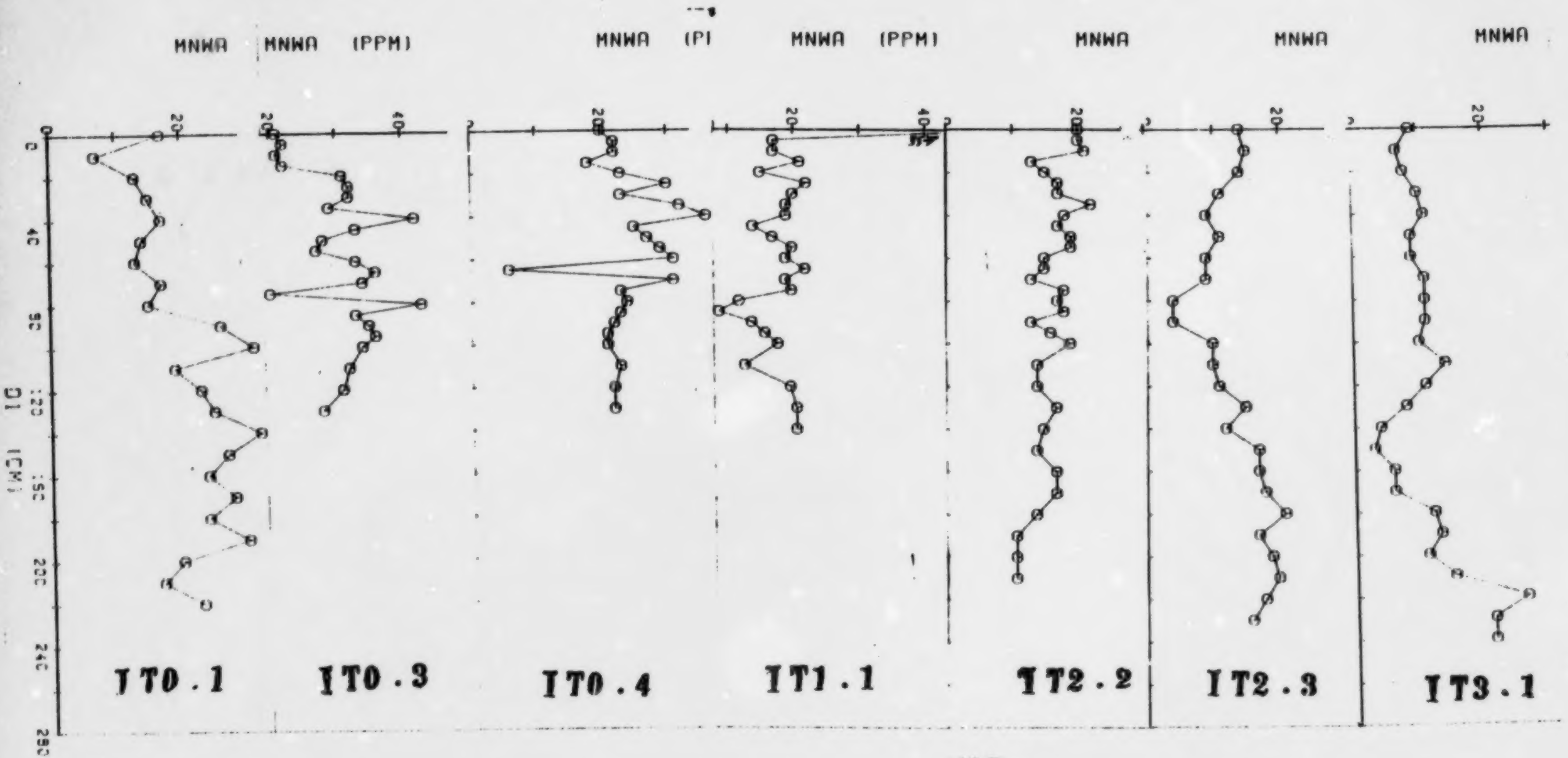


Fig. 10-8B. Weak acid leachable Manganese in 7 cores from Itirbilung Fjord

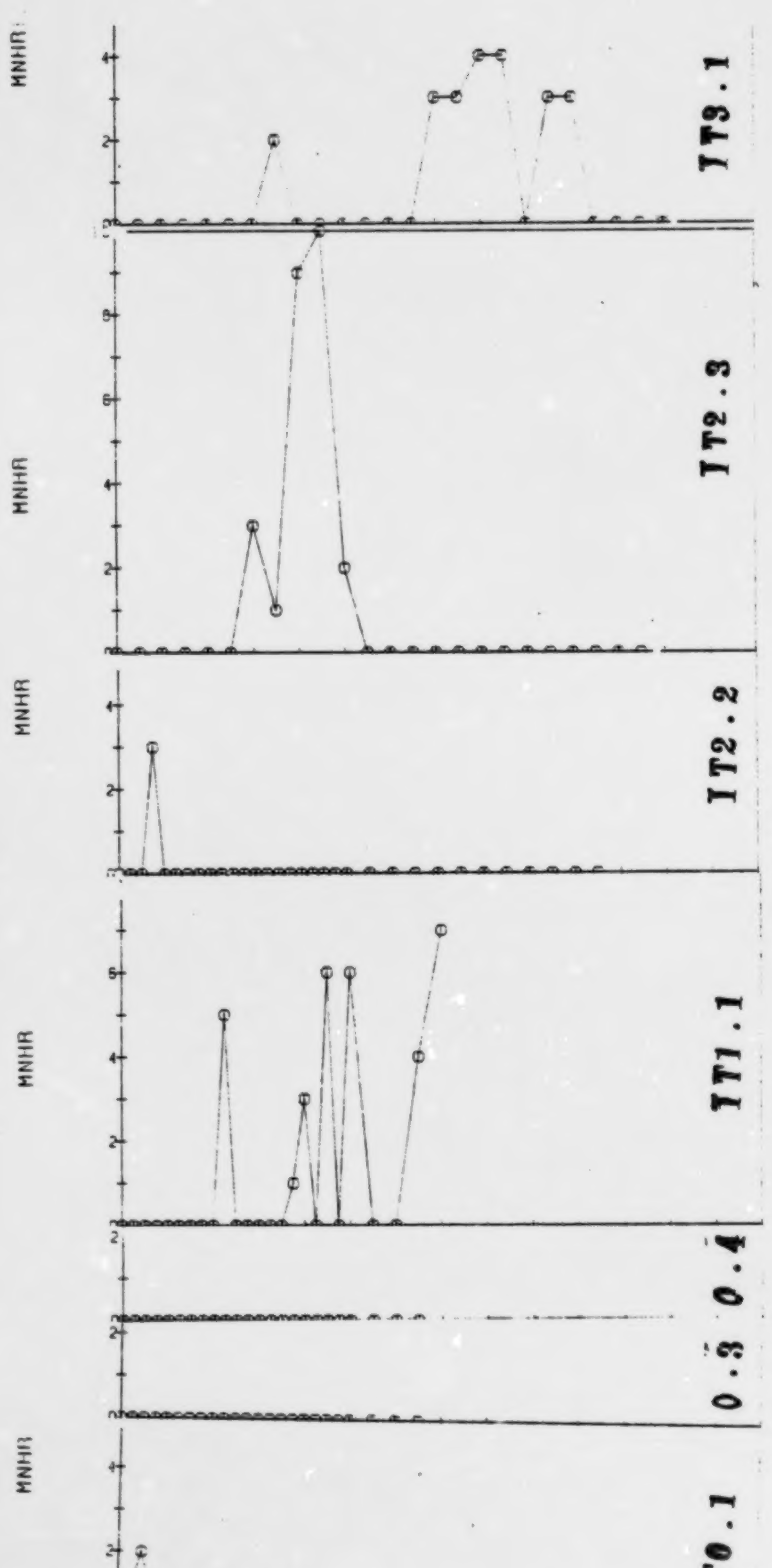


Fig. 10-9B. Reducible fraction of Manganese in 7 cores from Itirbilung Fjord

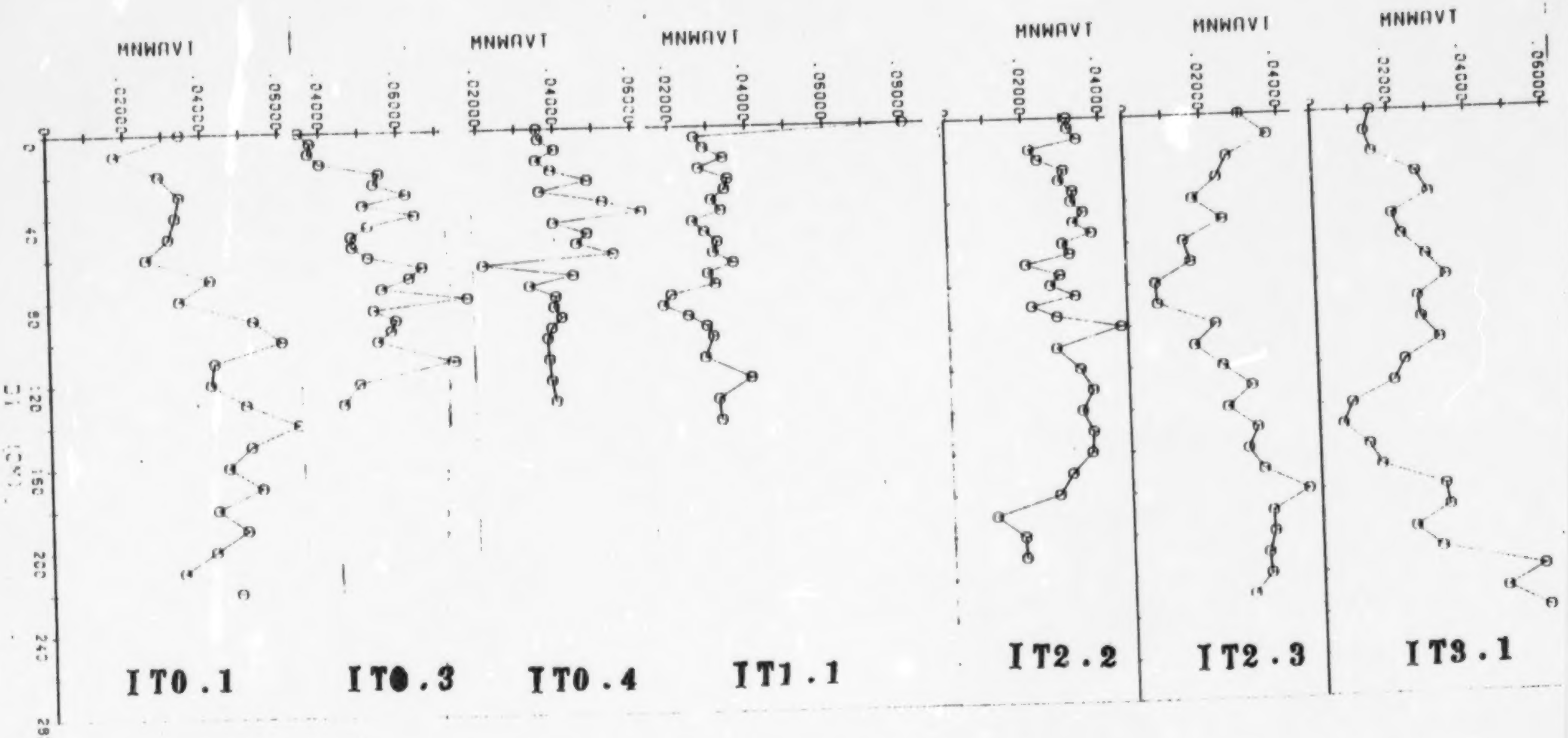


Fig. 10-10B. Ratio of weak acid leachable Manganese/total Manganese in 7 cores from Itirbilung Fjord

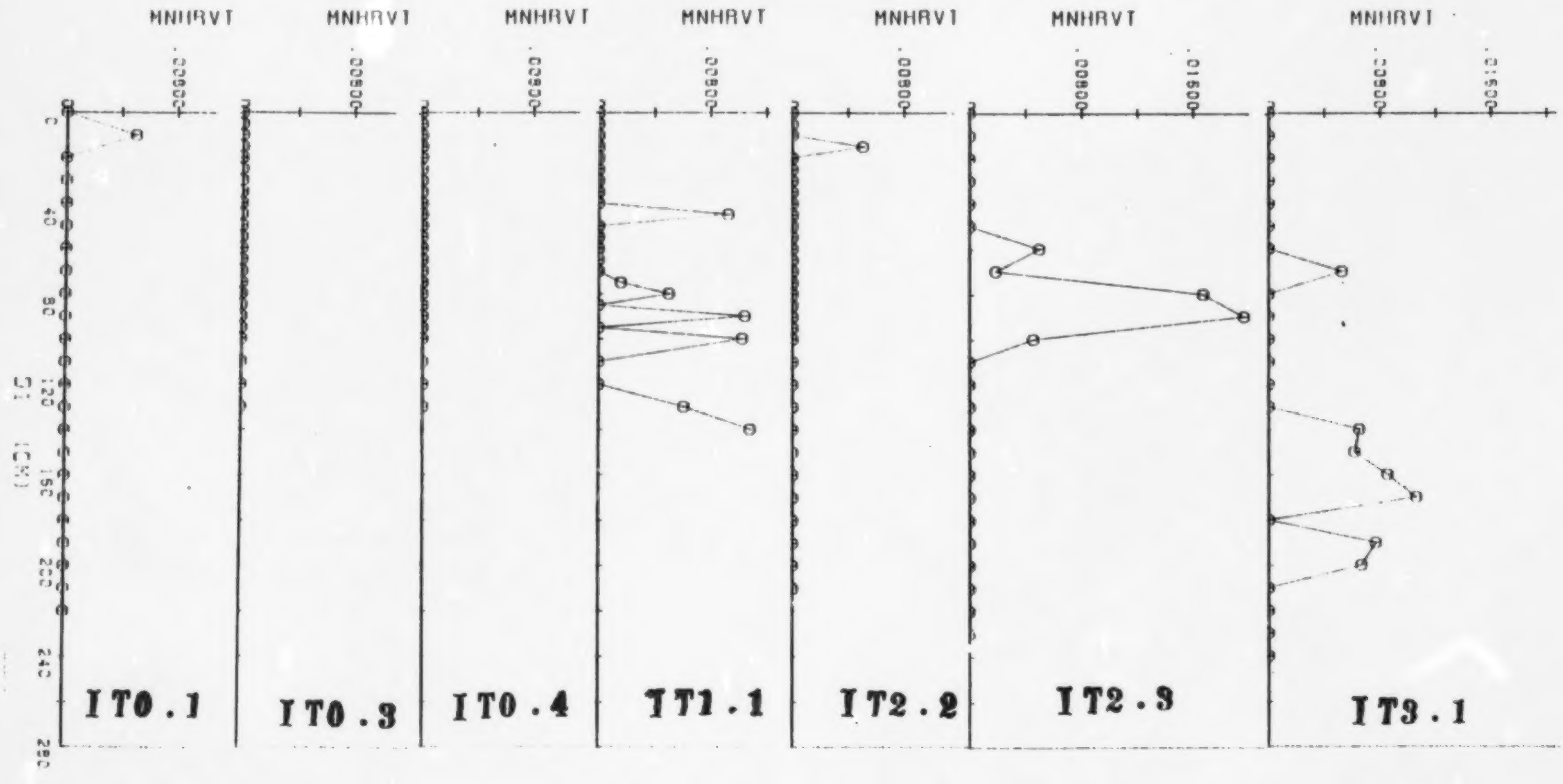


Fig. 10-11B. Ratio of reducible Manganese/total Manganese in 7 cores from Itirbilung Fjord

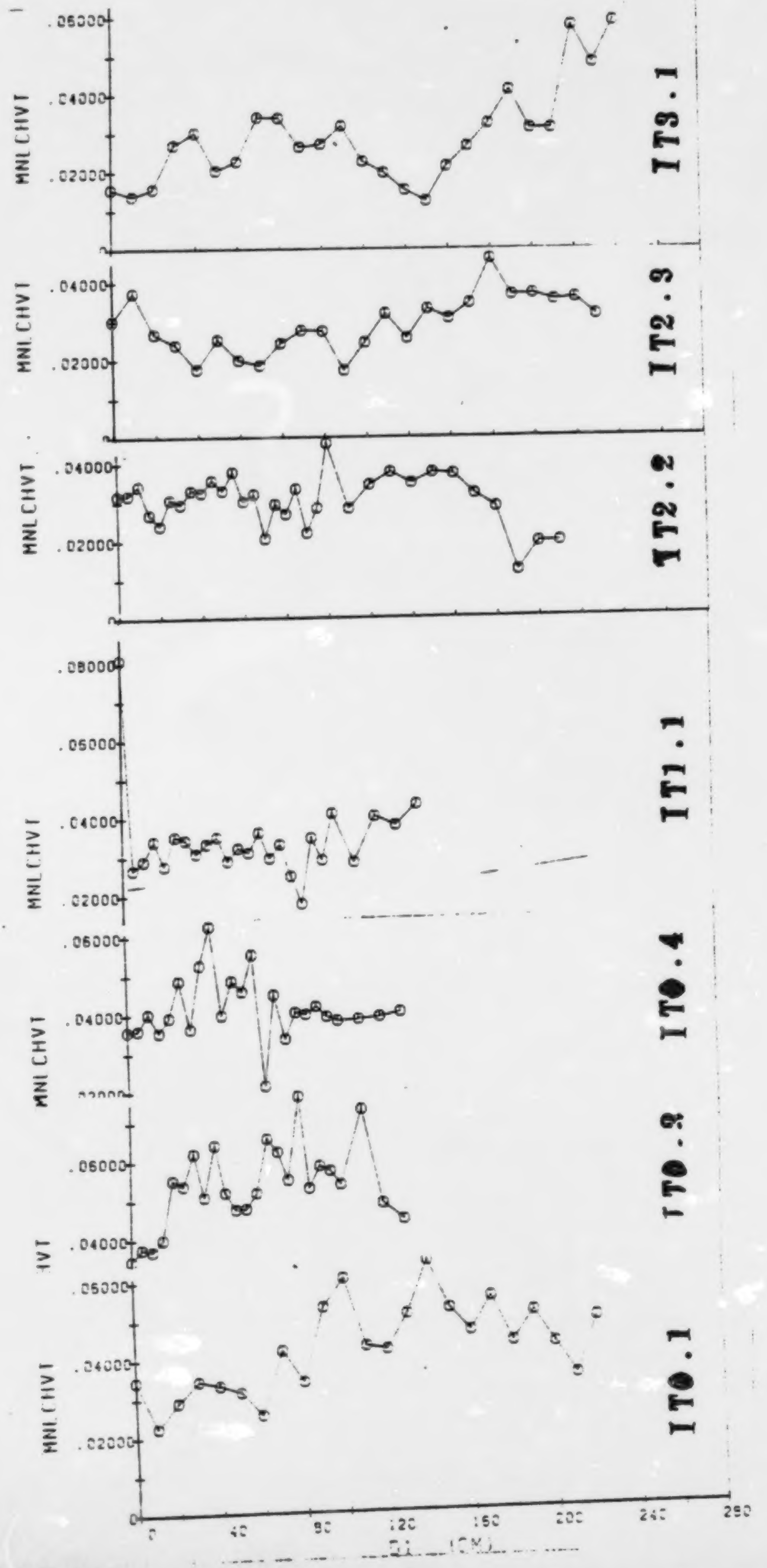


Fig. 10-12B. Ratio of labile Manganese/total Manganese in 7 cores from Itirbilung Fjord

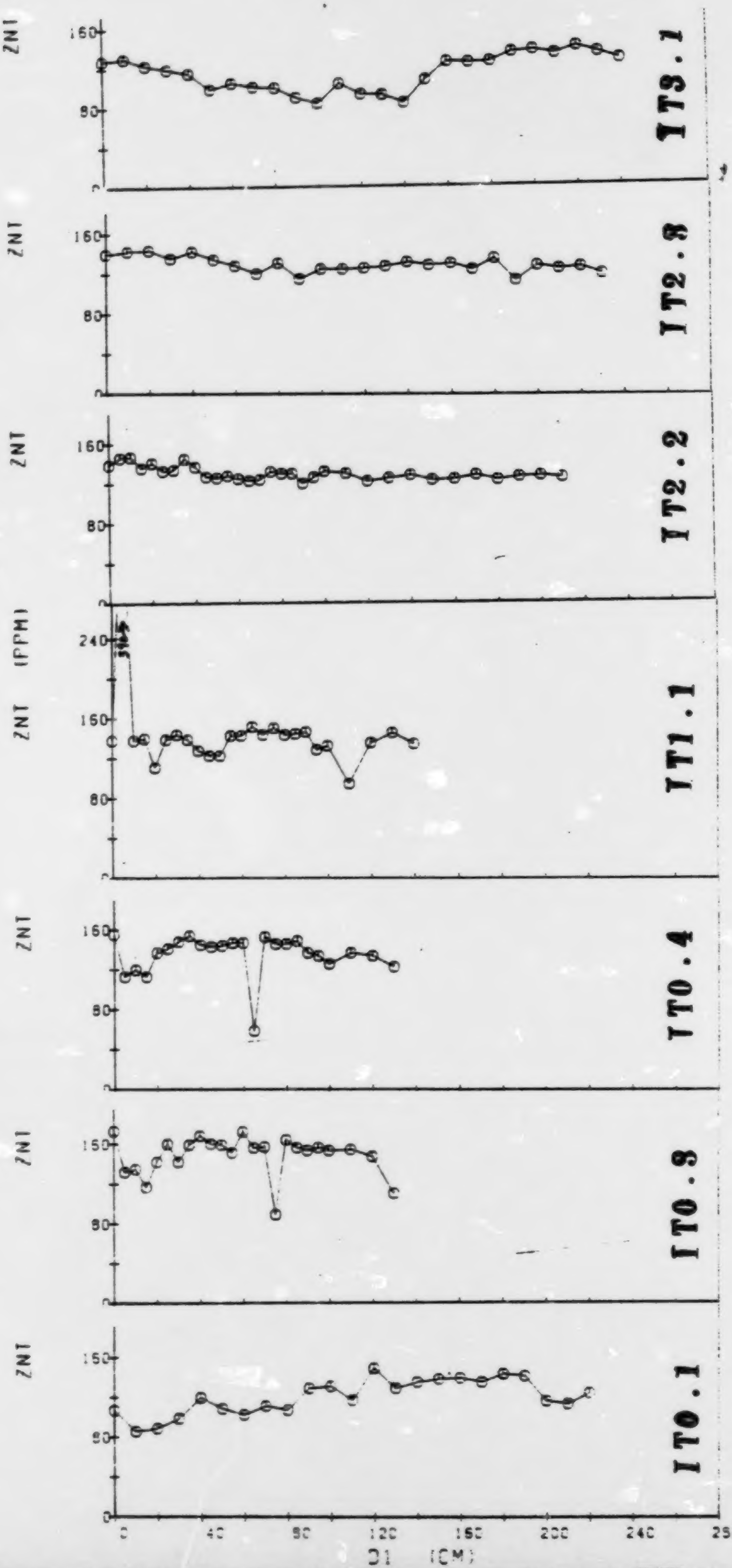


Fig. 10-13B. Total Zinc in 7 cores from Itirbilung Fjord

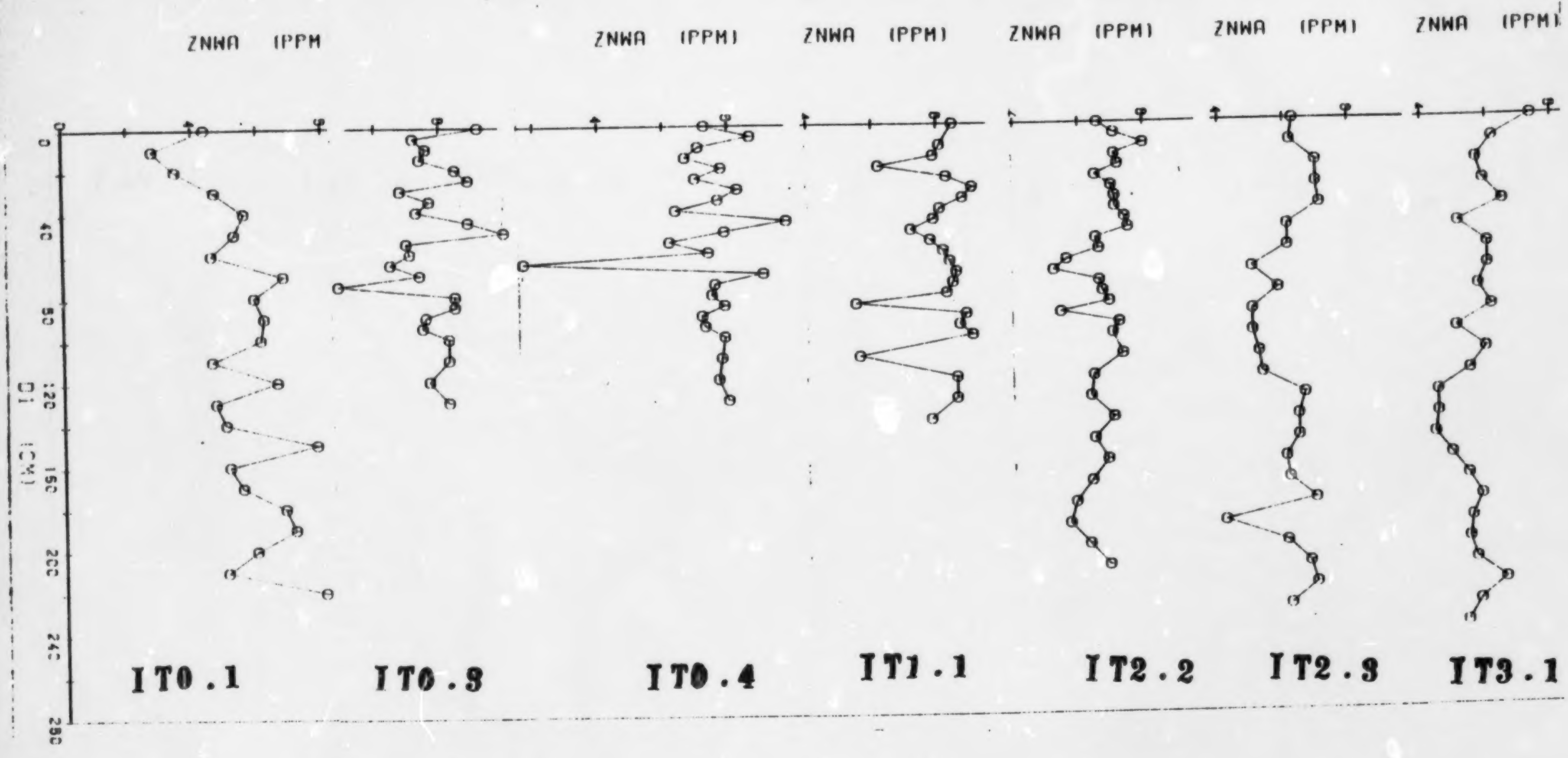


Fig. 10-14B. Weak acid leachable Zinc in 7 cores from Itirbilung Fjord

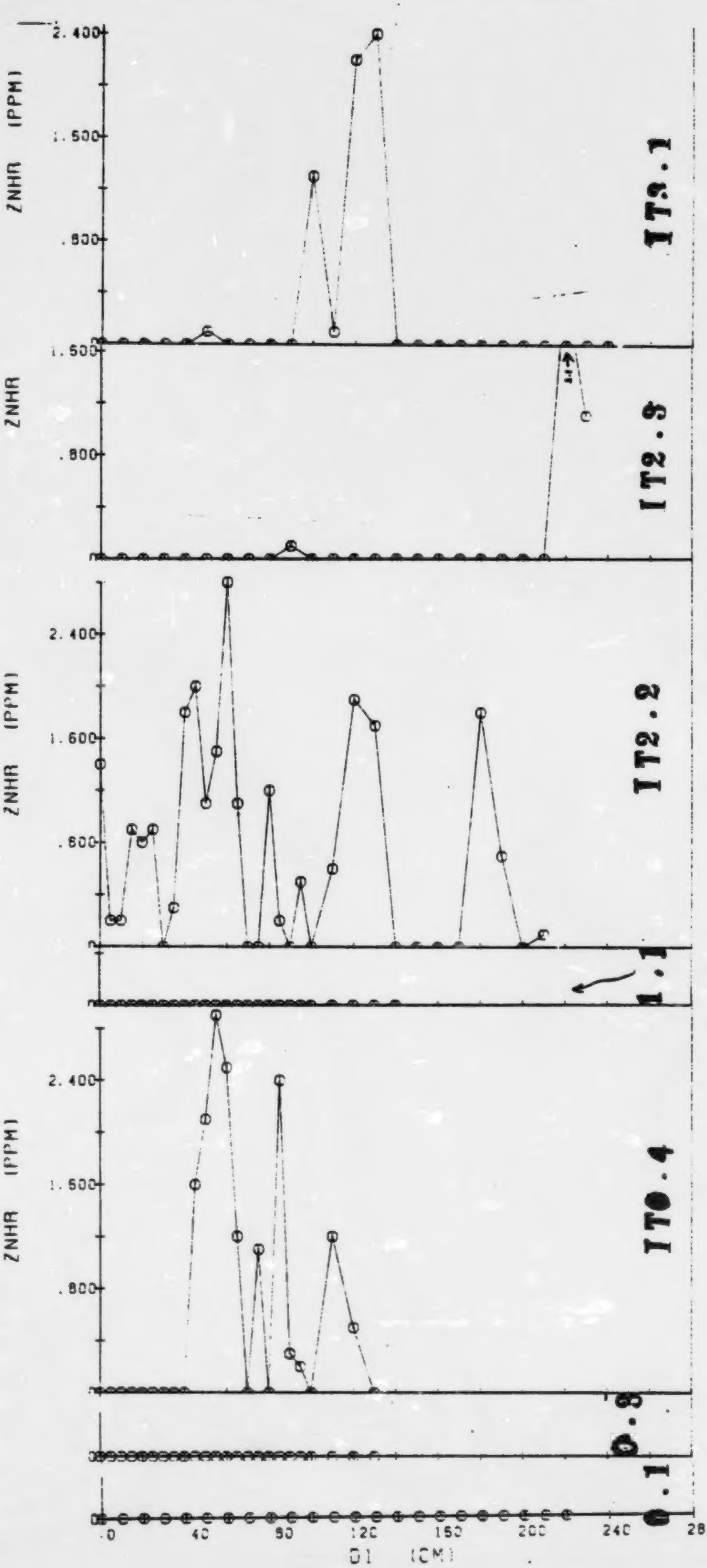


Fig. 10-15B. Reducible fraction of Zinc in 7 cores from Itirbilung Fjord

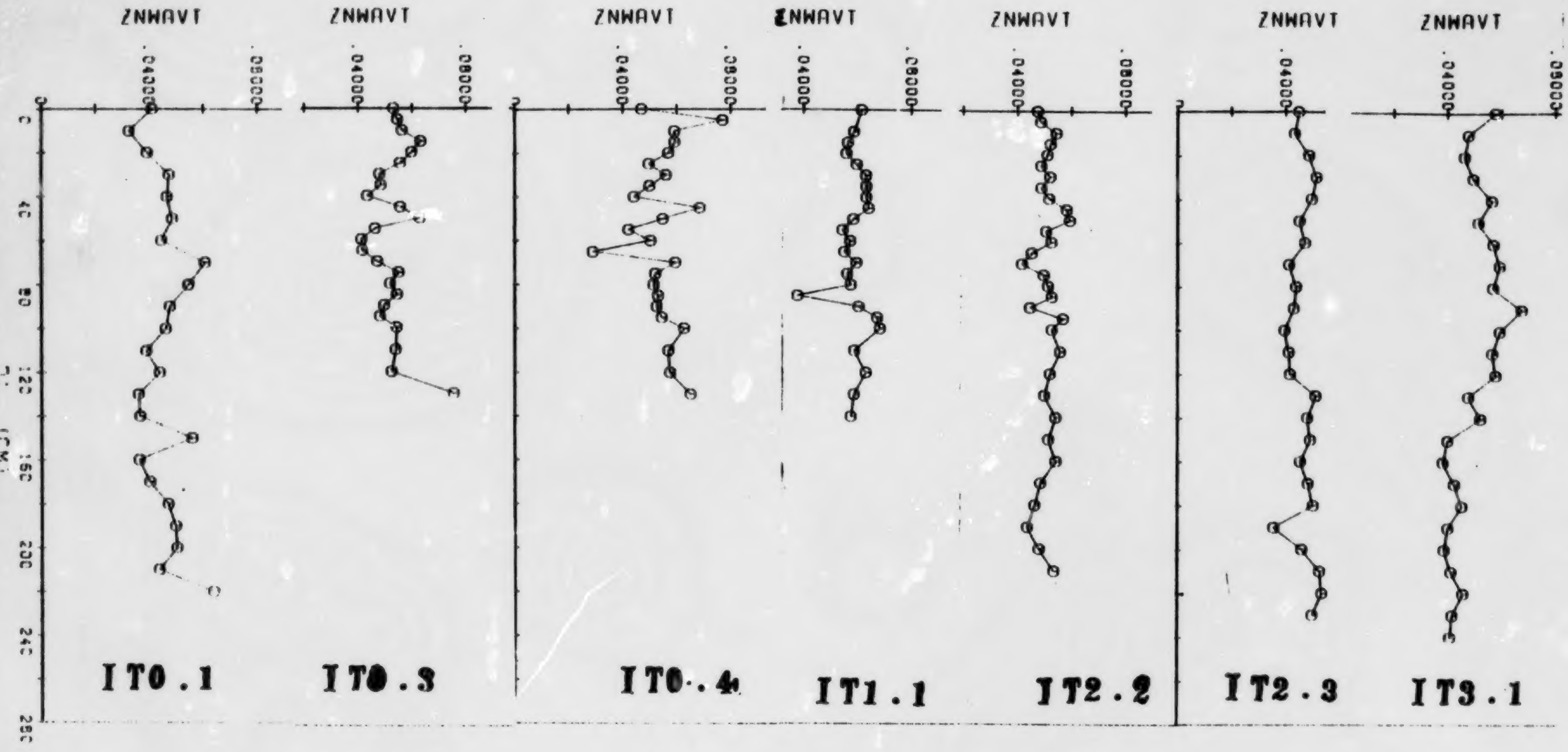


Fig. 10-16B. Ratio of weak acid leachable Zinc/total Zinc in 7 cores from Itirbilung Fjord

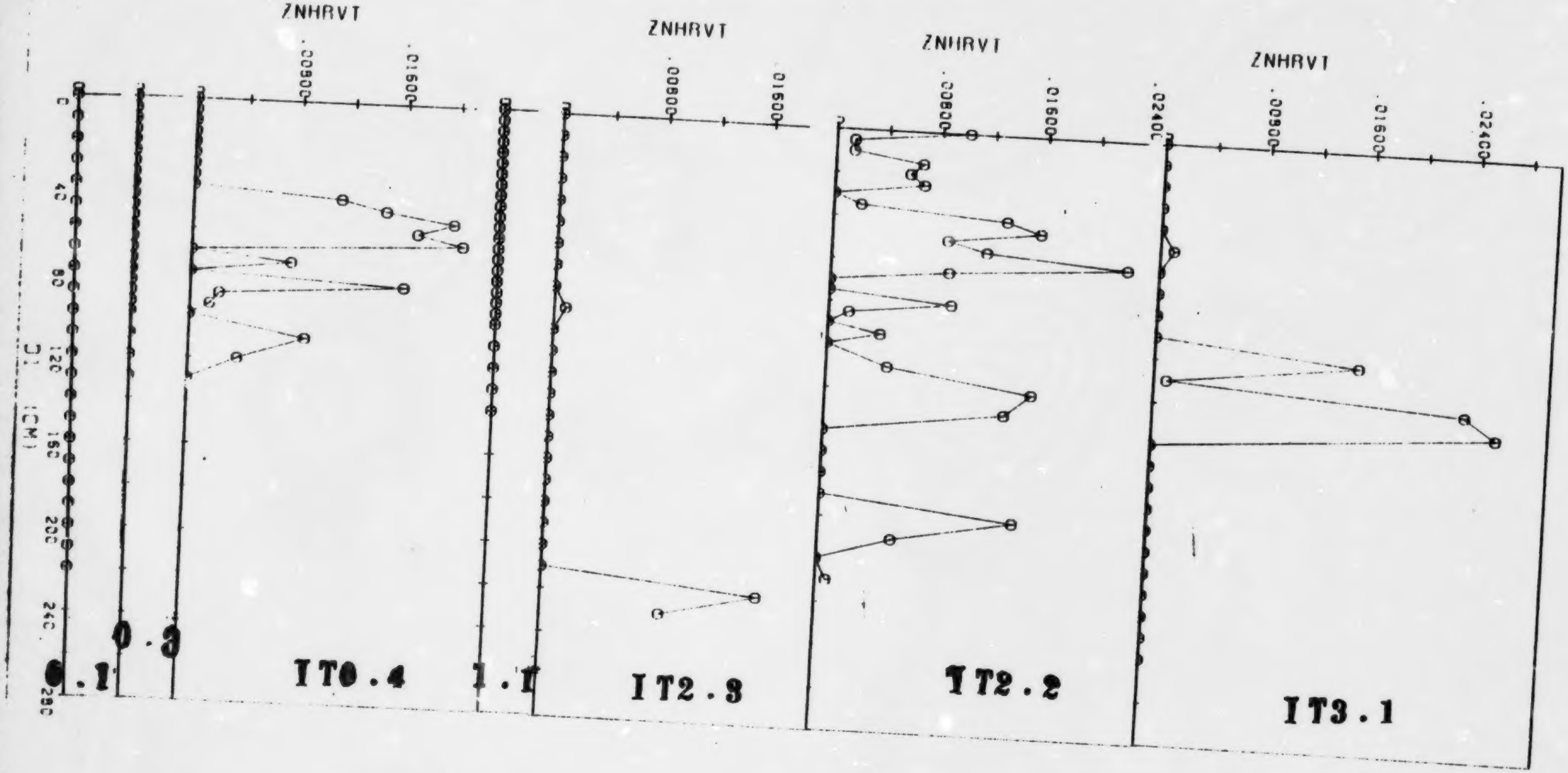


Fig. 10-17B. Ratio of reducible Zinc/total Zinc in 7 cores from Itirbilung Fjord

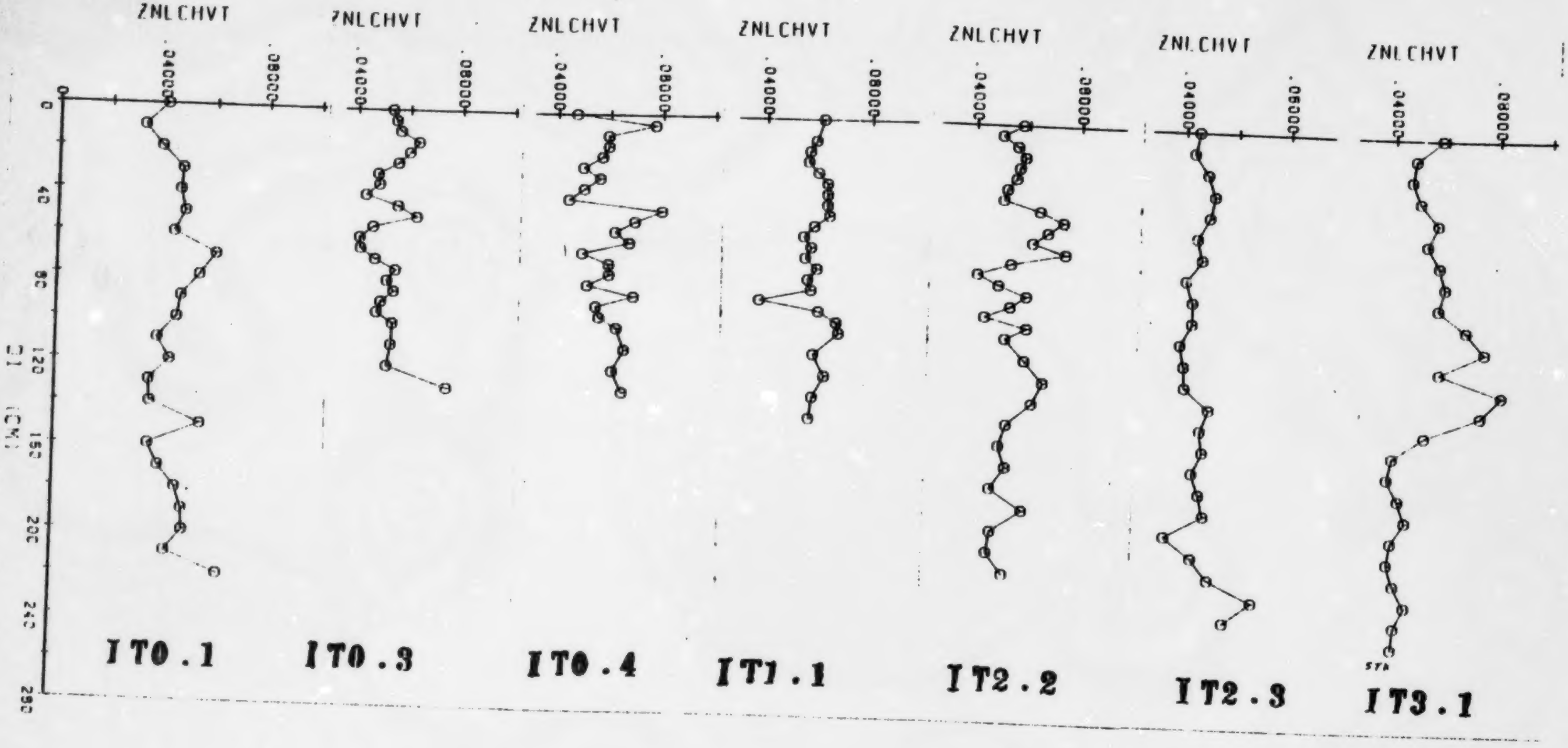


Fig. 10-18B. Ratio of labile Zinc/total Zinc in 7 cores from Itirbilung Fjord

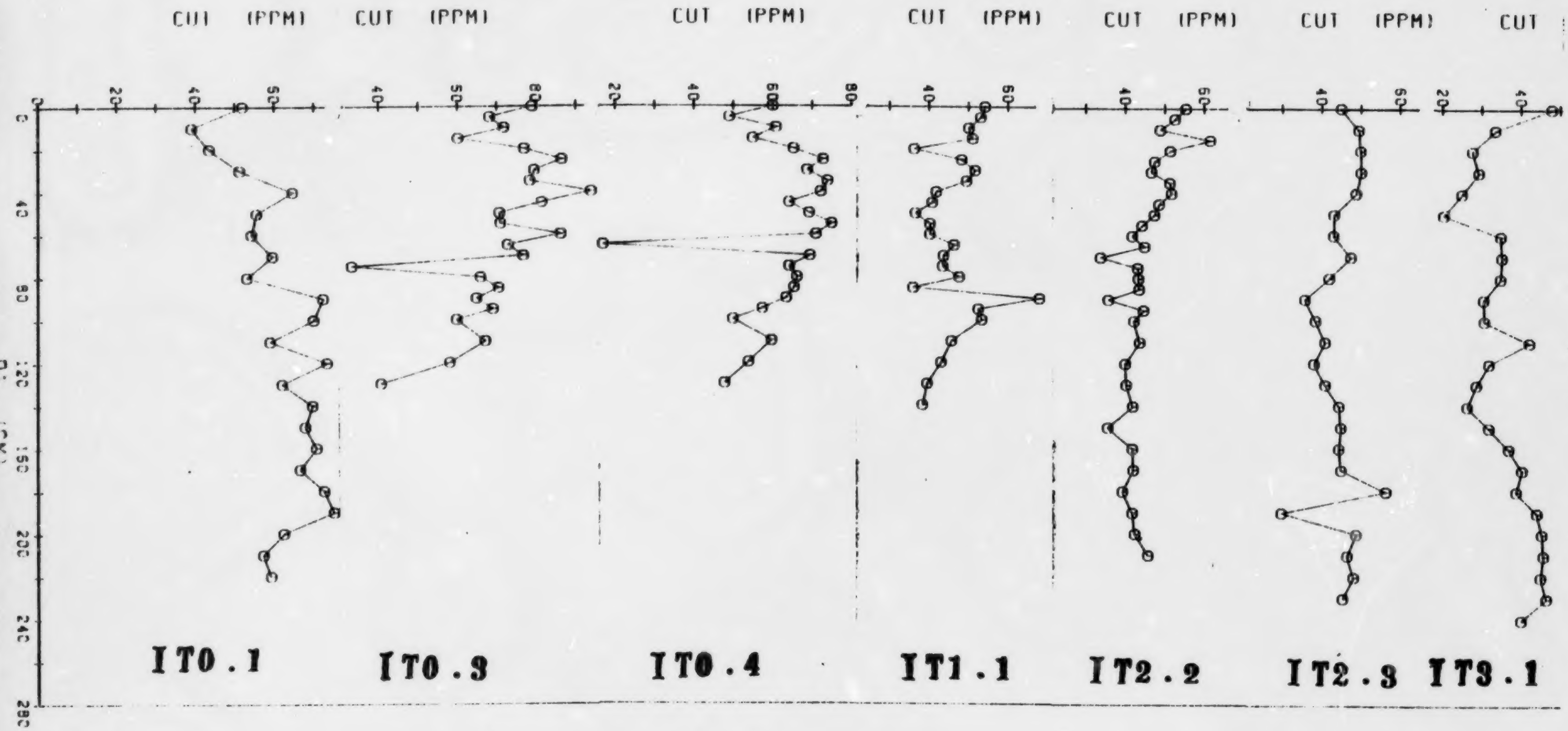


Fig. 10-19B. Total Copper in 7 cores from Itirbilung Fjord

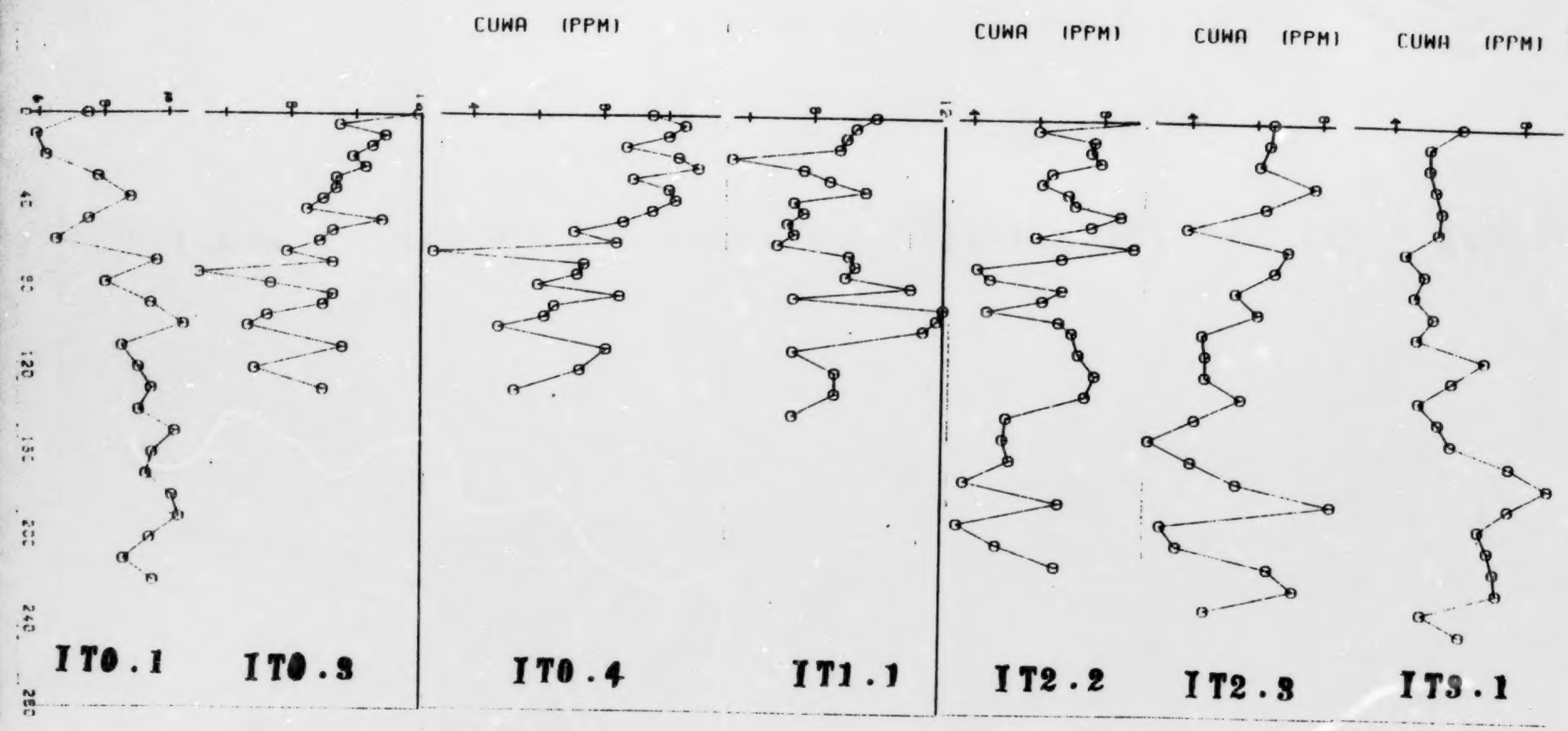


Fig. 10-20B. Weak acid leachable Copper in 7 cores from Itirbilung Fjord

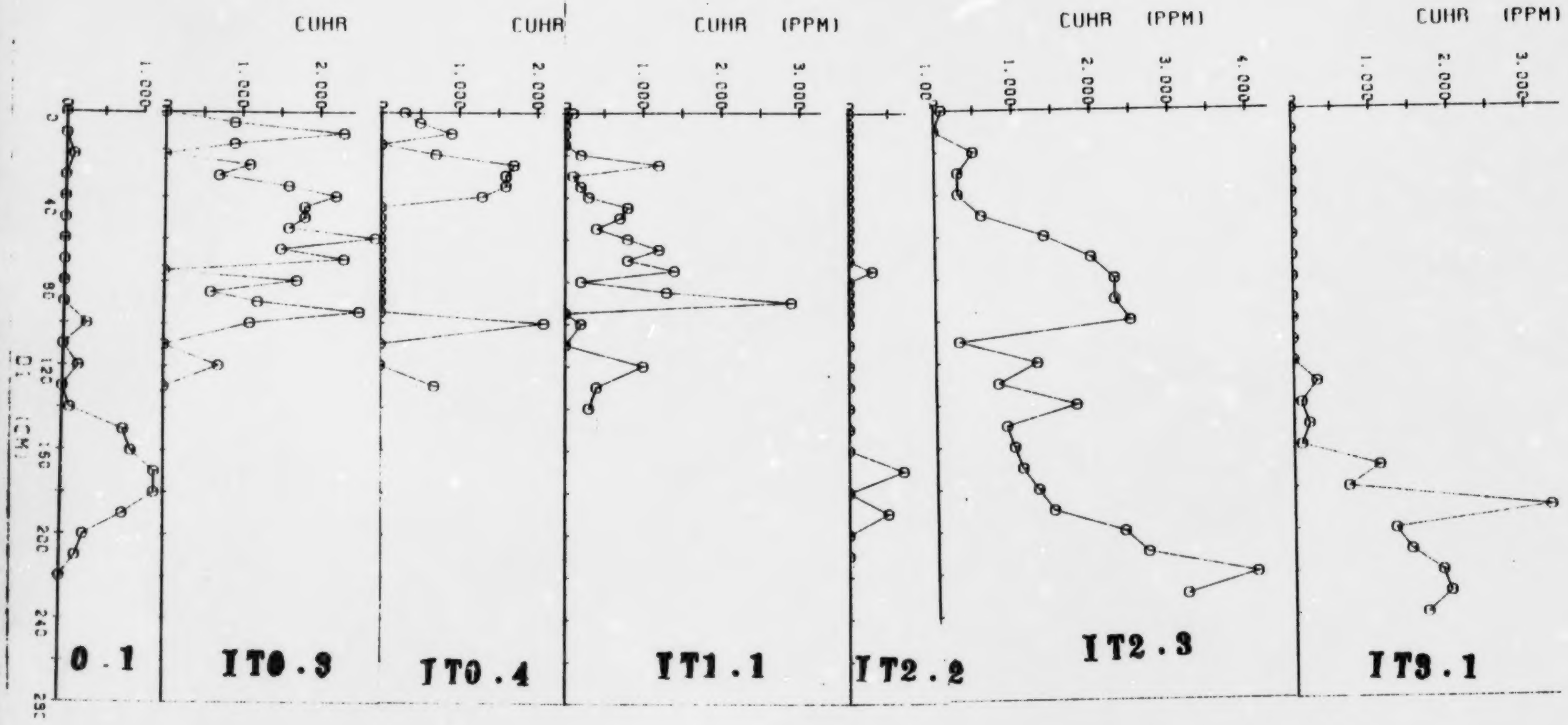


Fig. 10-21B. Reducible fraction of Copper in 7 cores from Itirbilung Fjord

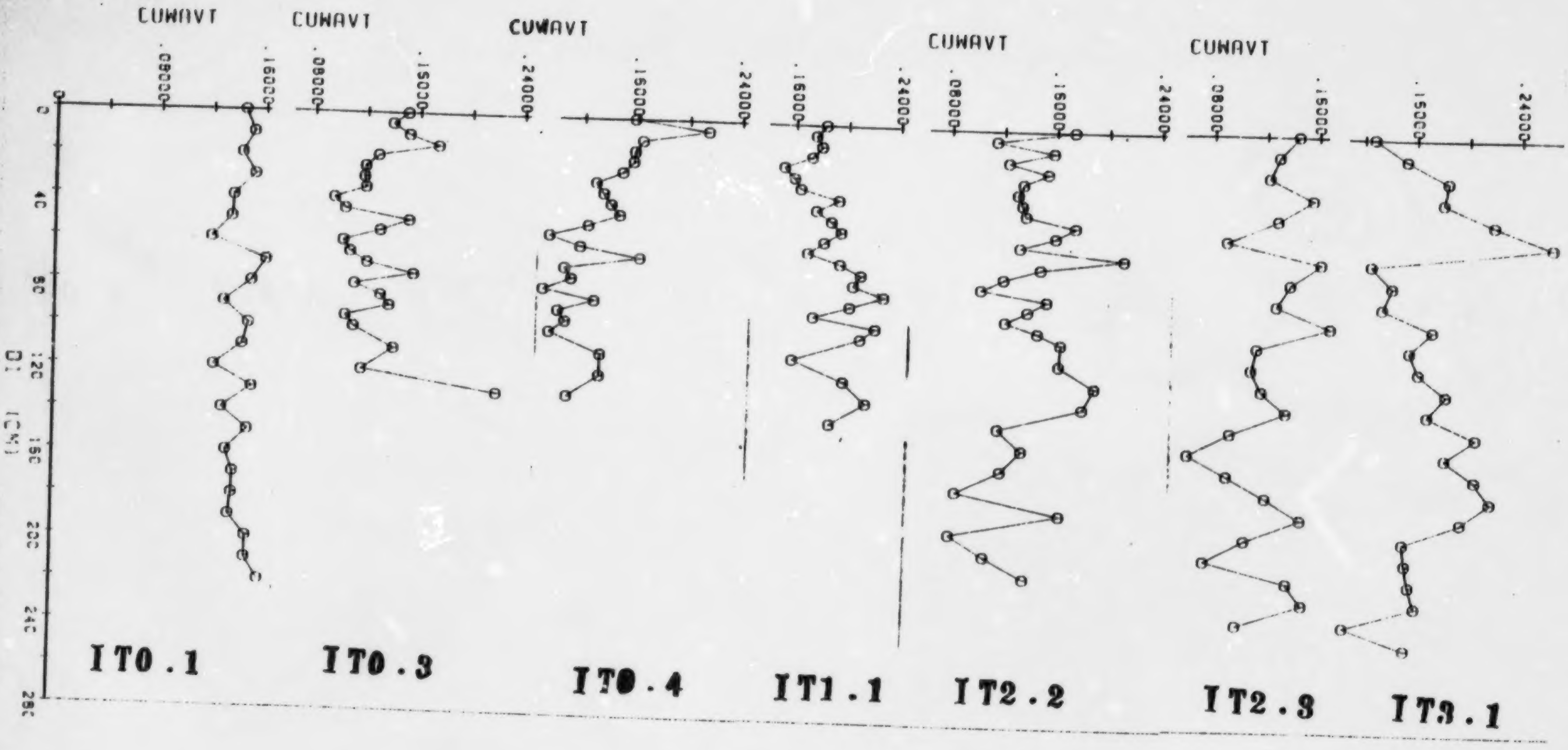


Fig. 10-22B. Ratio of Weak acid leachable Copper/total Copper in 7 cores from Itirbilung Fjord

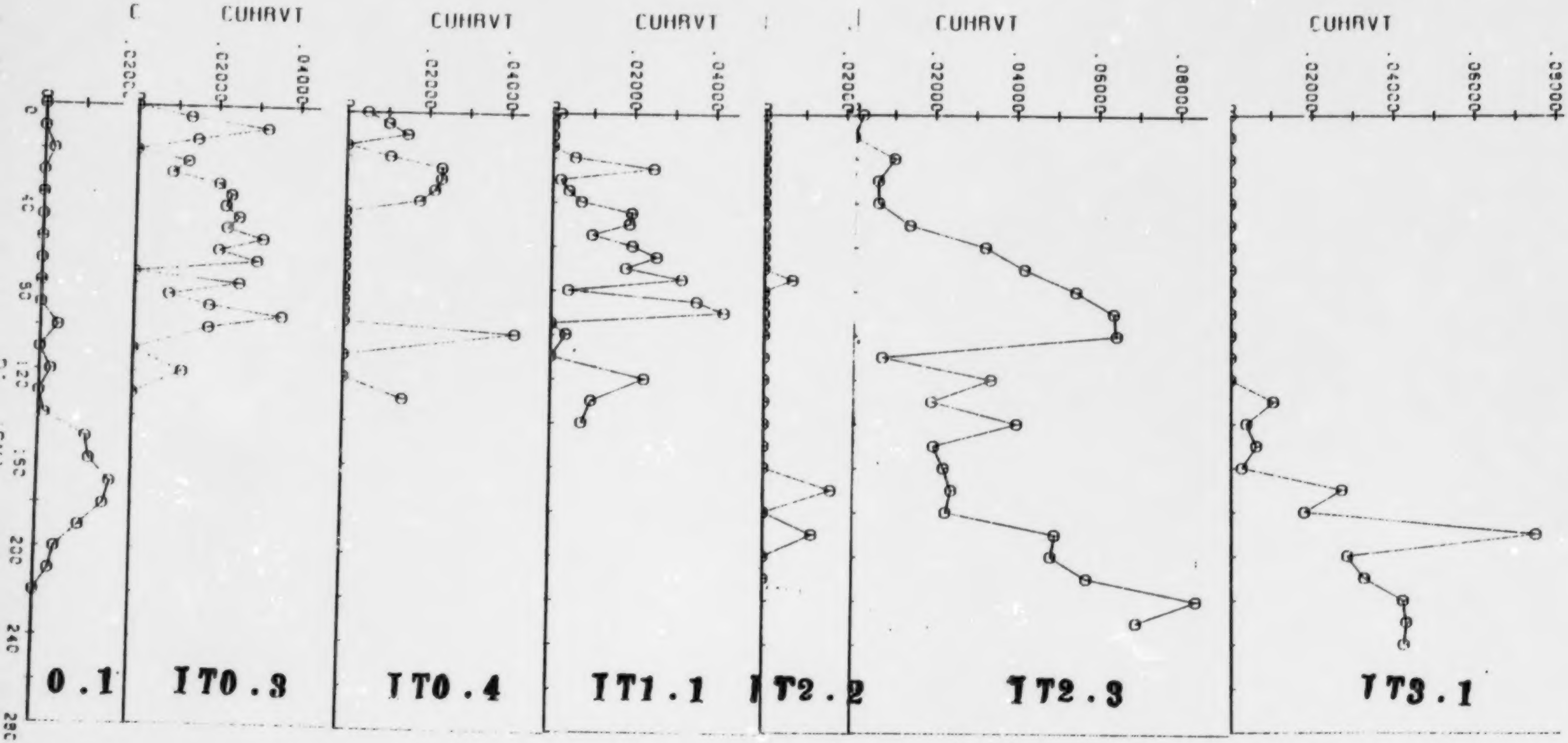


Fig. 10-23B. Ratio of reducible Copper/total Copper in 7 cores from Itirbilung Fjord

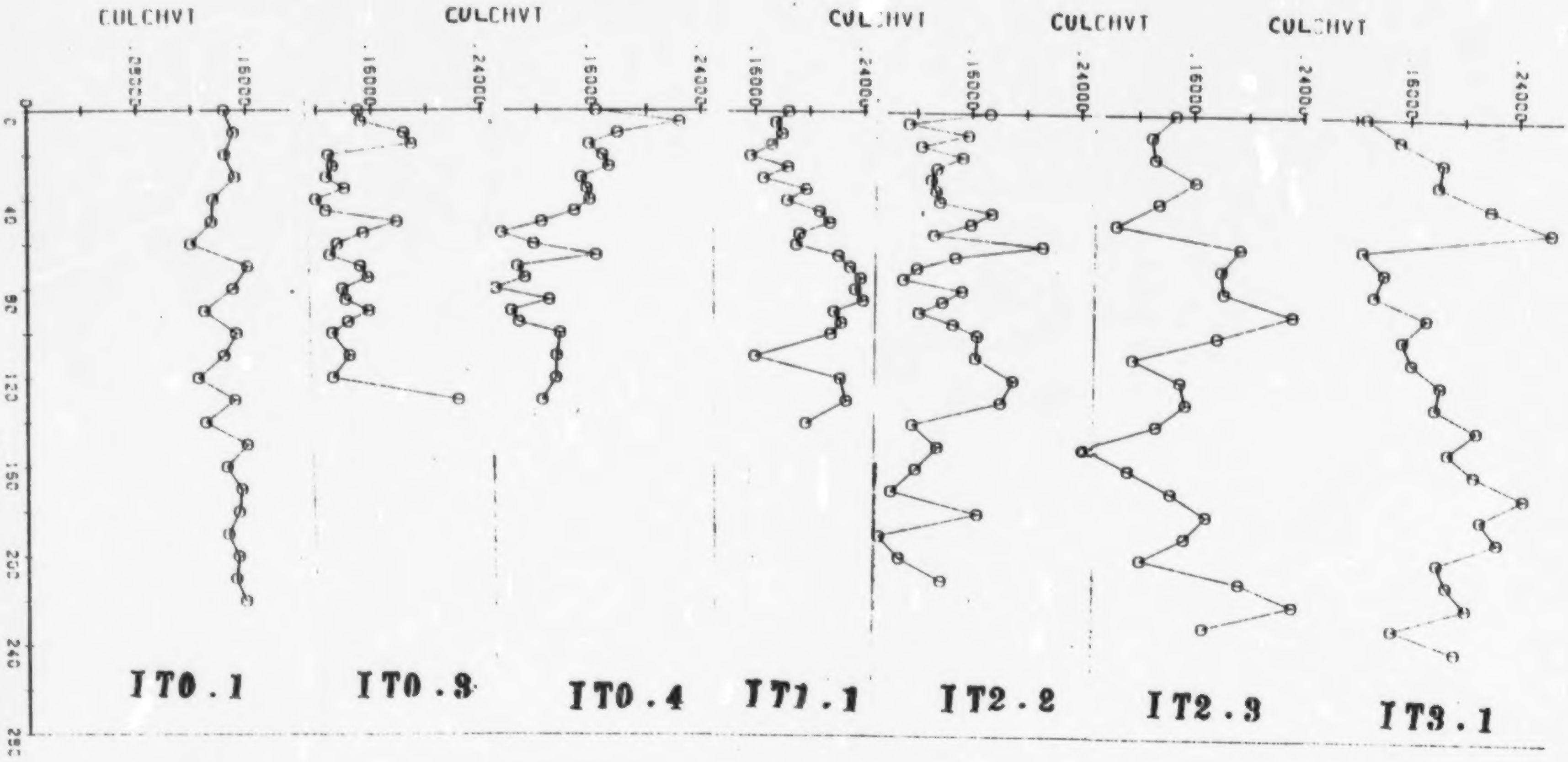


Fig. 10-24B. Ratio of labile Copper/total Copper in 7 cores from Itirbilung Fjord

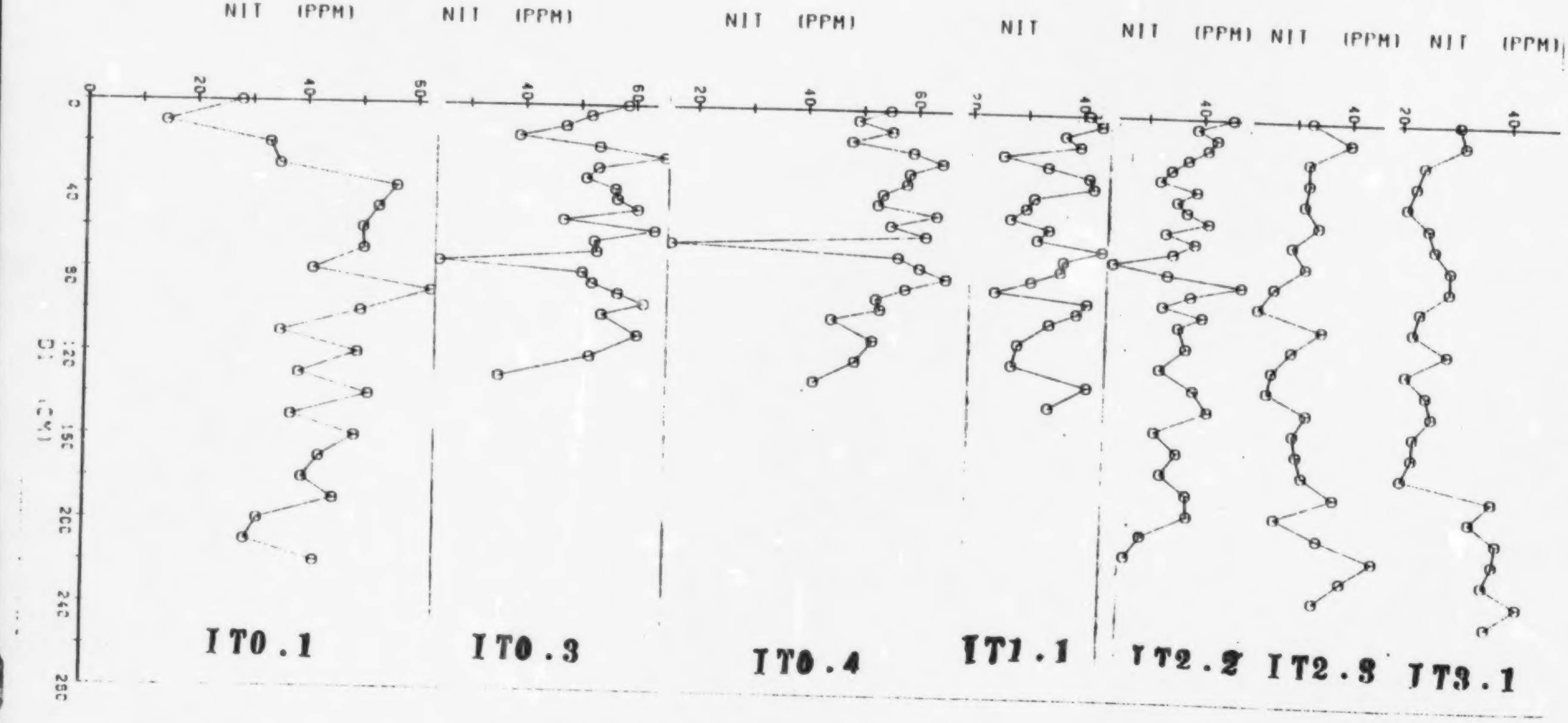


Fig. 10-25B. Total Nickel in 7 cores from Itirbilung Fjord

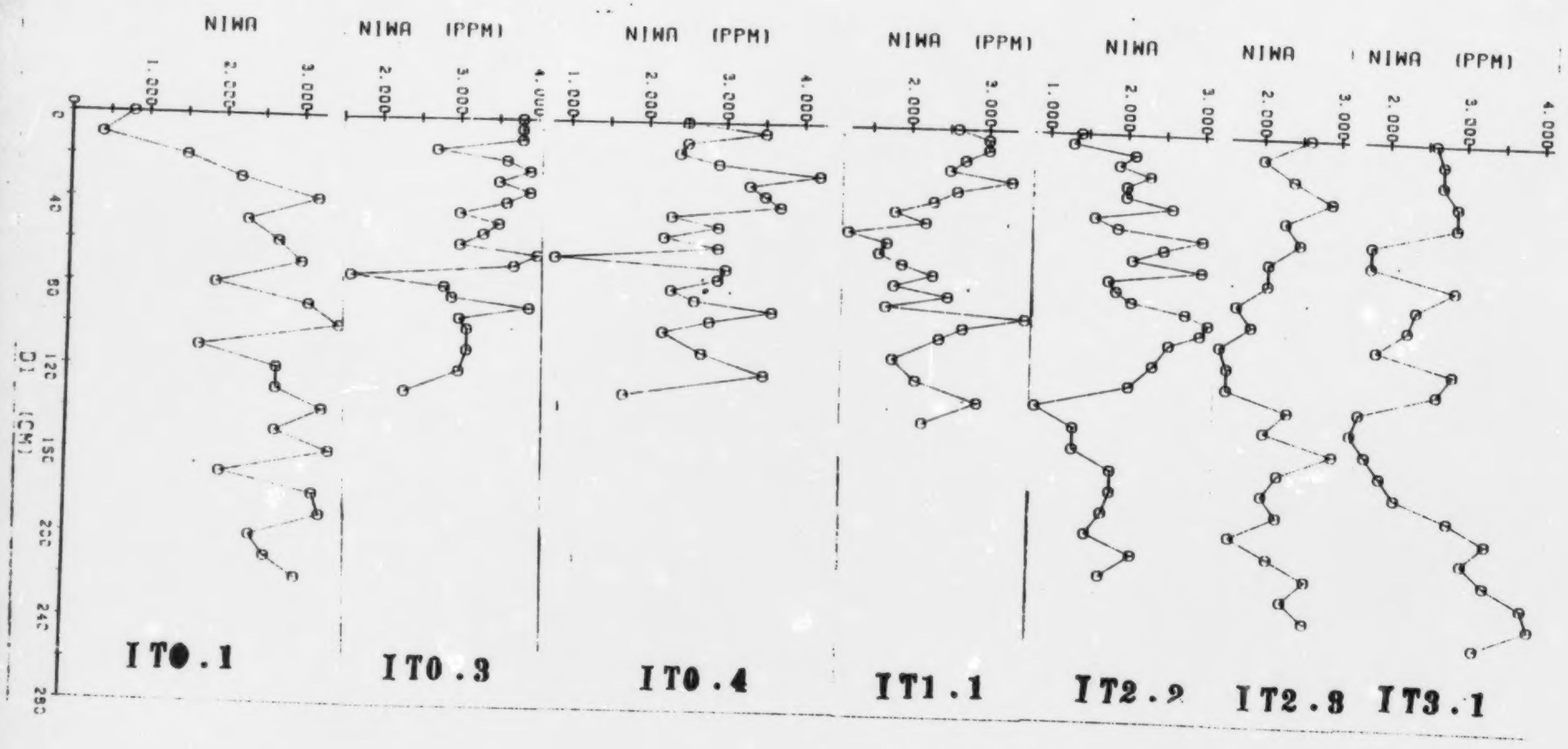


Fig. 10-26B. Weak acid leachable Nickel in 7 cores from Itirbilung Fjord

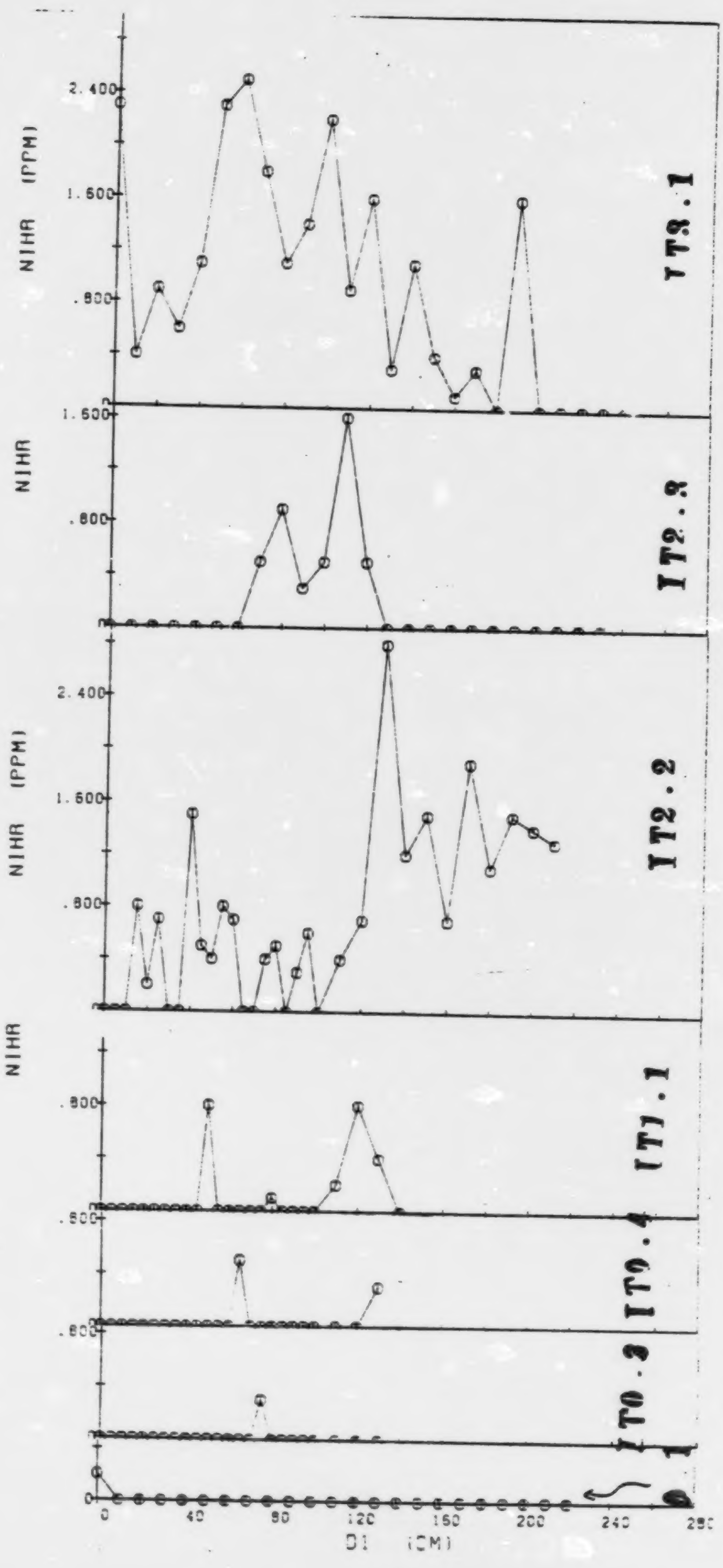


Fig. 10-27B. Reducible fraction of Nickel in 7 cores from Itirbilung Fjord

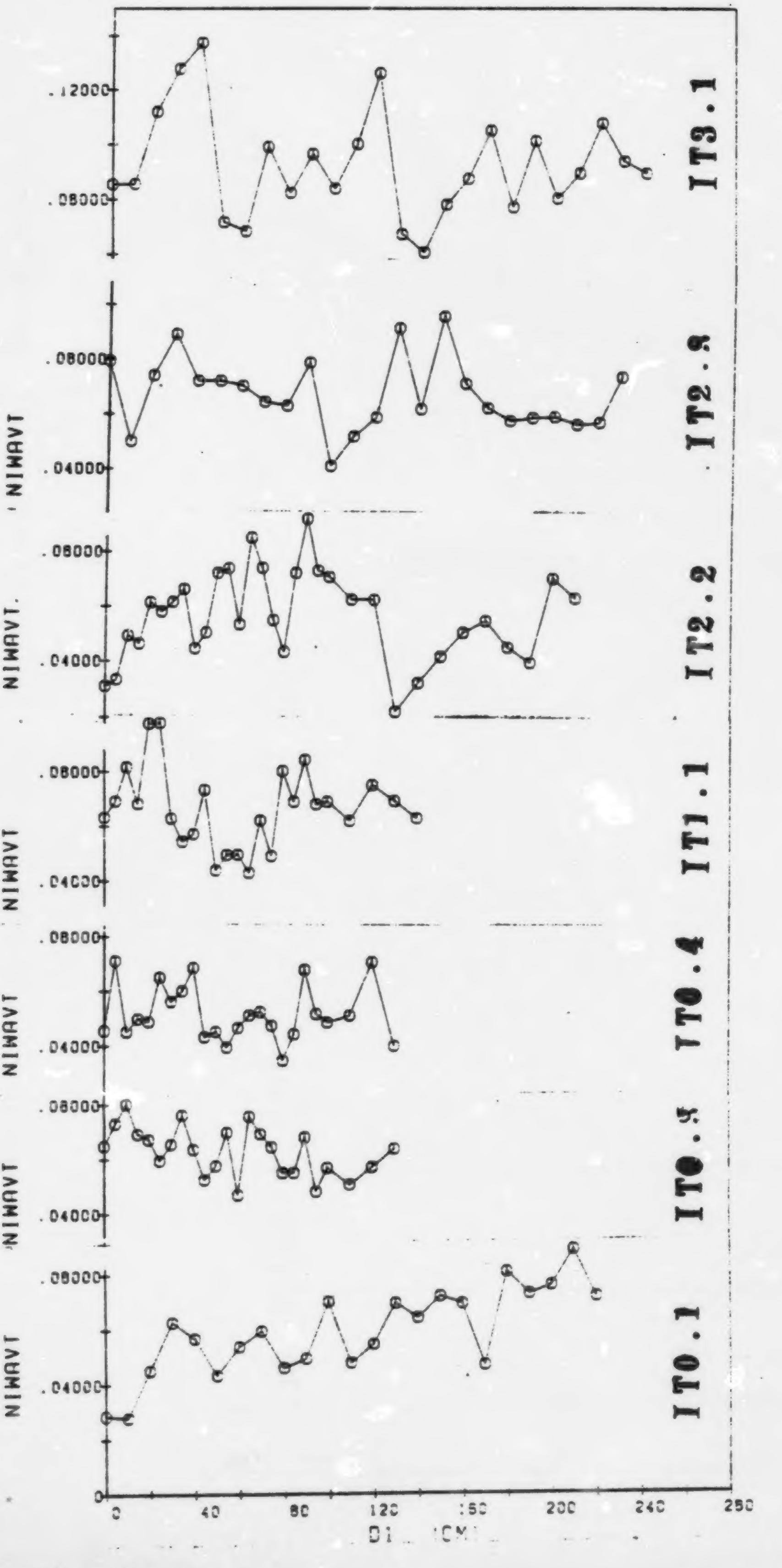


Fig. 10-28B. Ratio of weak acid leachable Nickel/total Nickel in 7 cores from Itirbilung Fjord

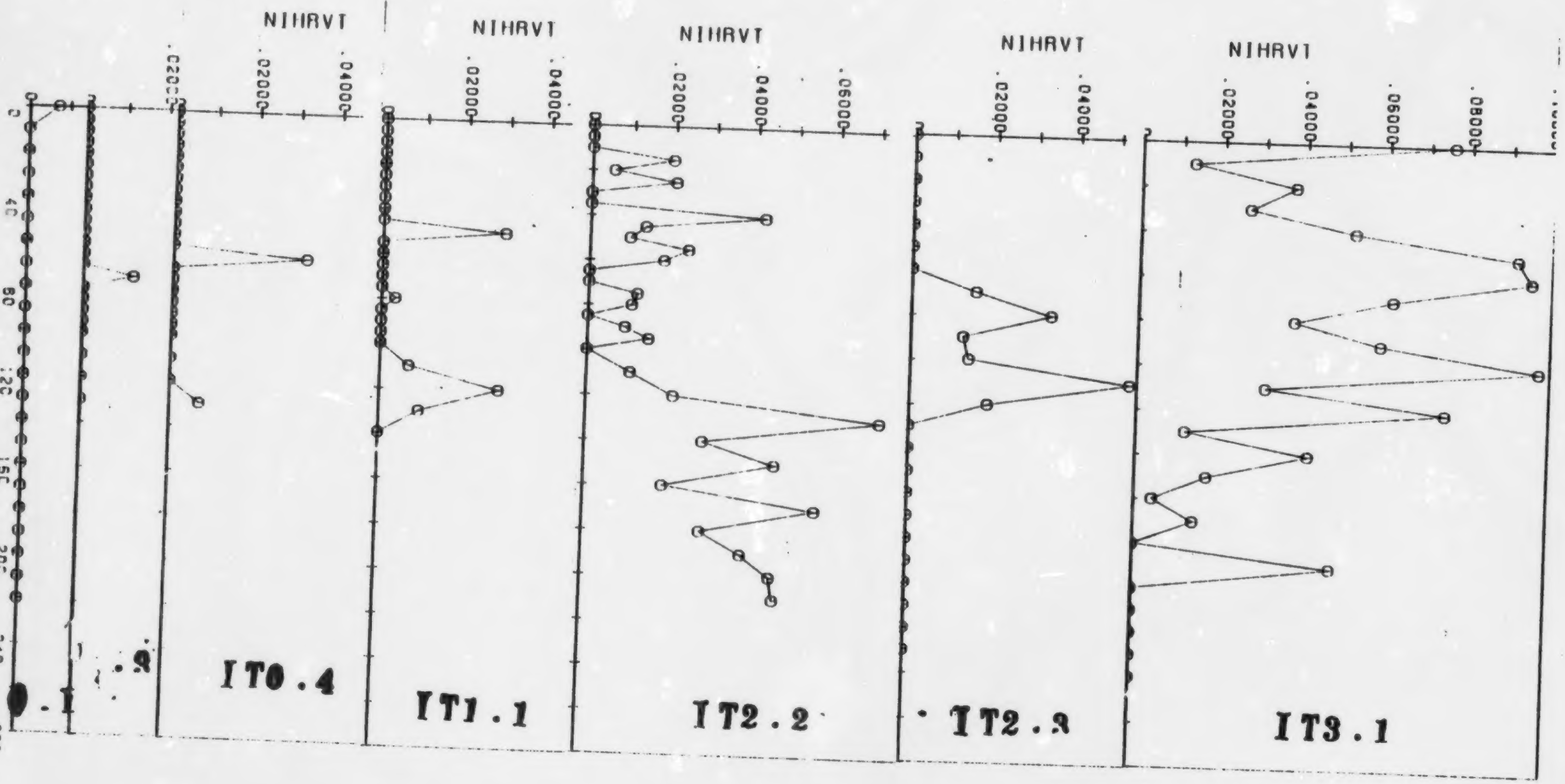


Fig. 10-29B. Ratio of reducible Nickel/total Nickel in 7 cores from Itirbilung Fjord

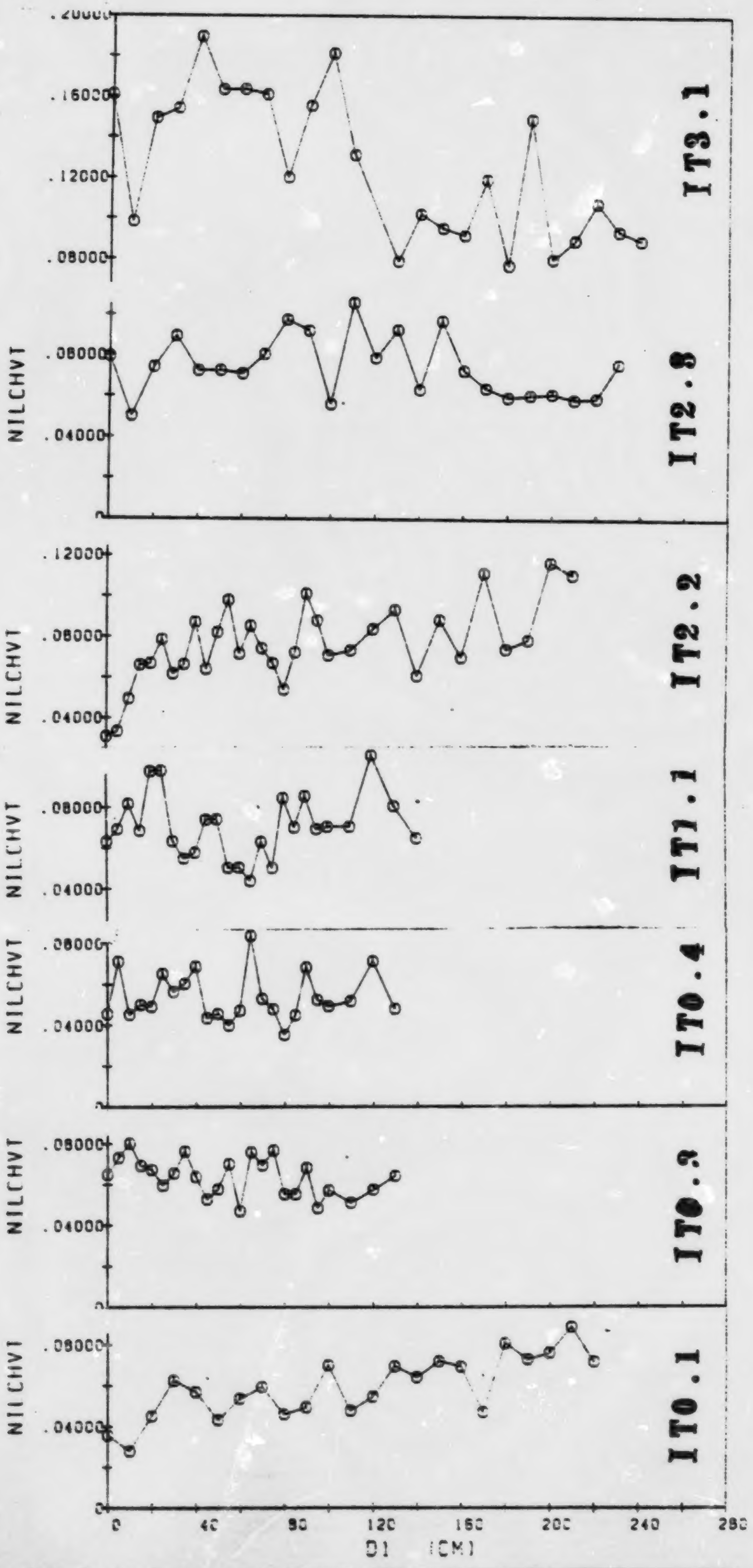


Fig. 10-30B. Ratio of label Nickel/total Nickel in 7 cores from Itirbilung Fjord

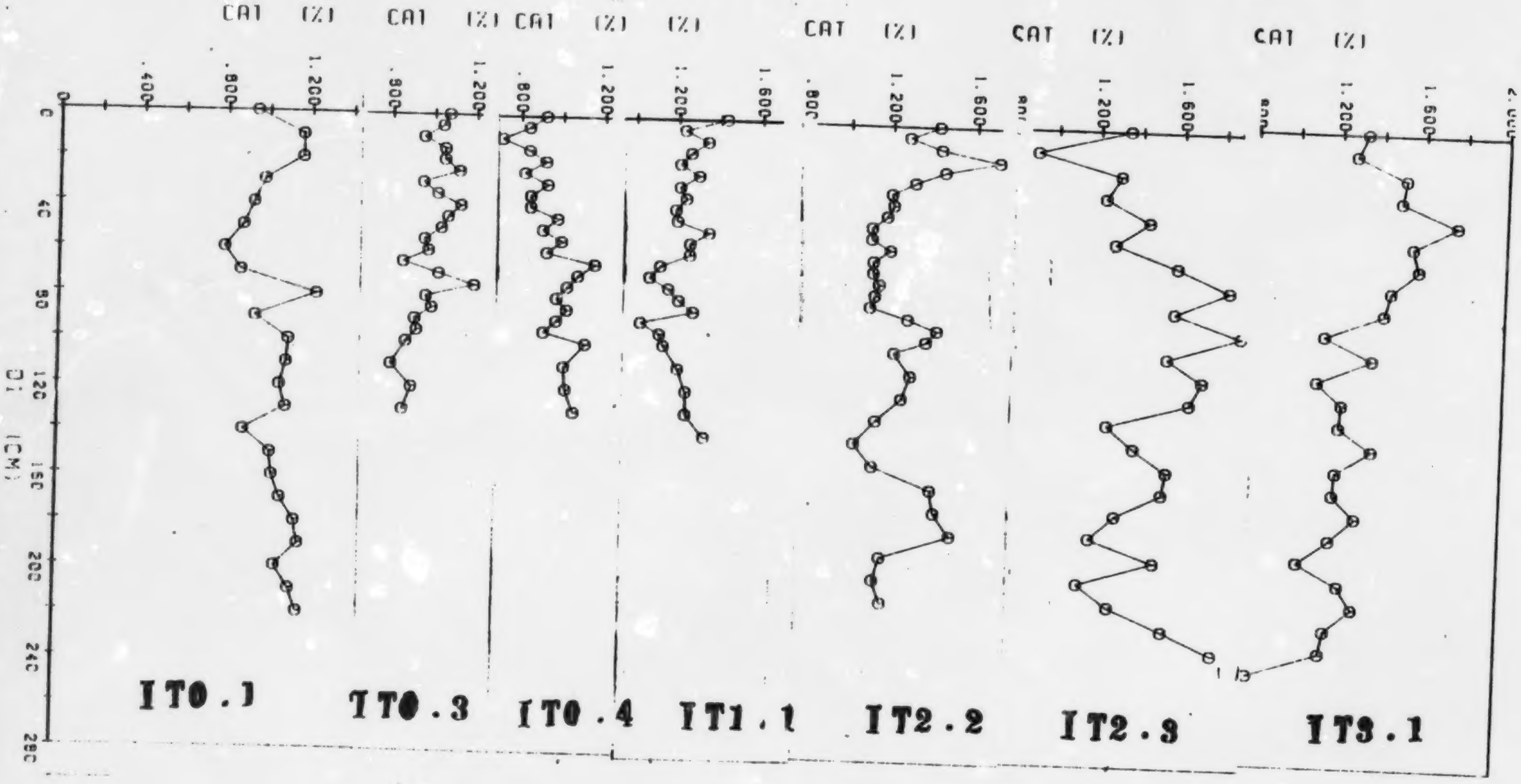


Fig. 10-31B. Total Calcium in 7 cores from Itirbilung Fjord

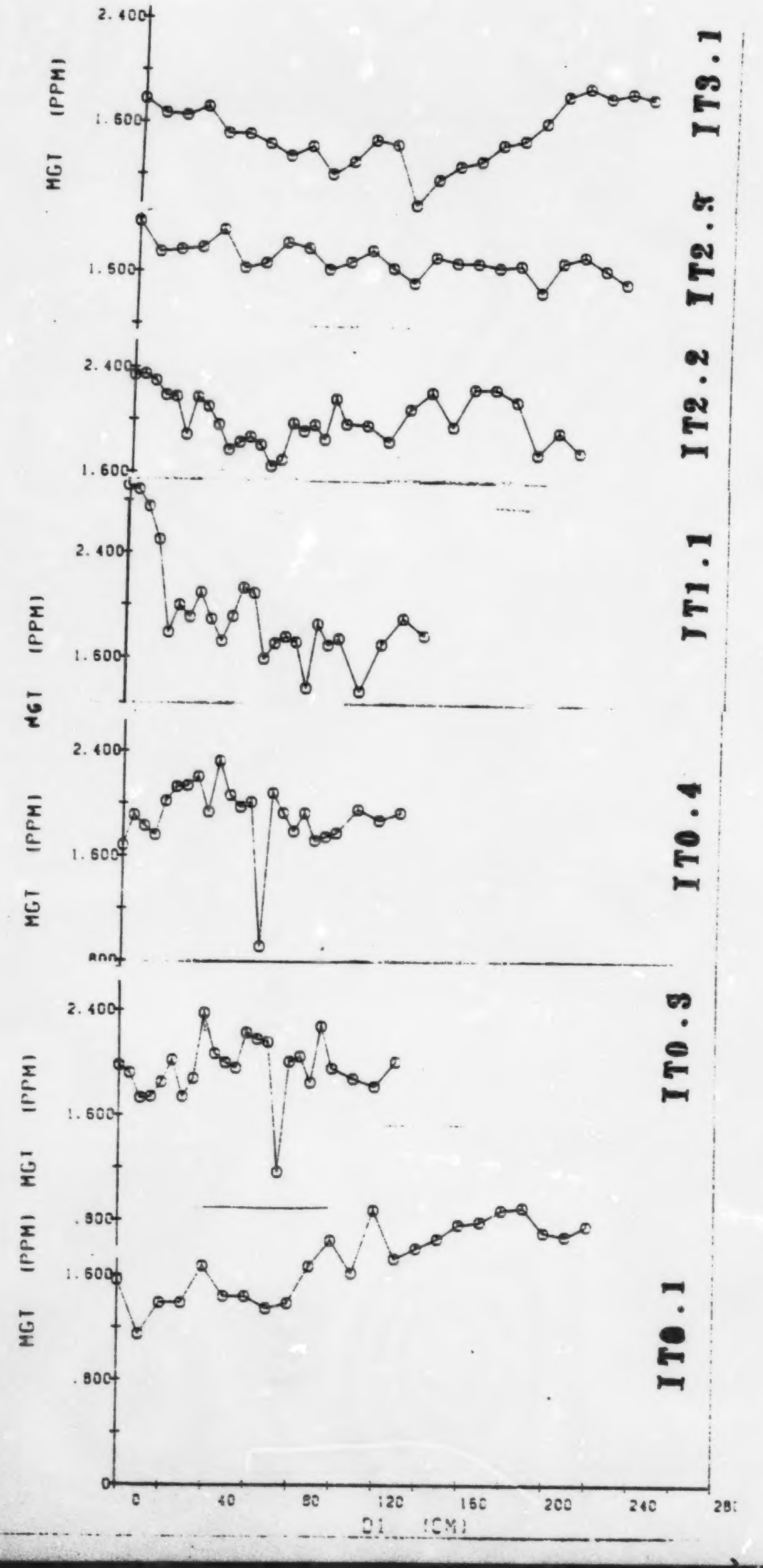


Fig. 10-32B. Total Mangnesium in 7 cores from Itirbilung Fjord

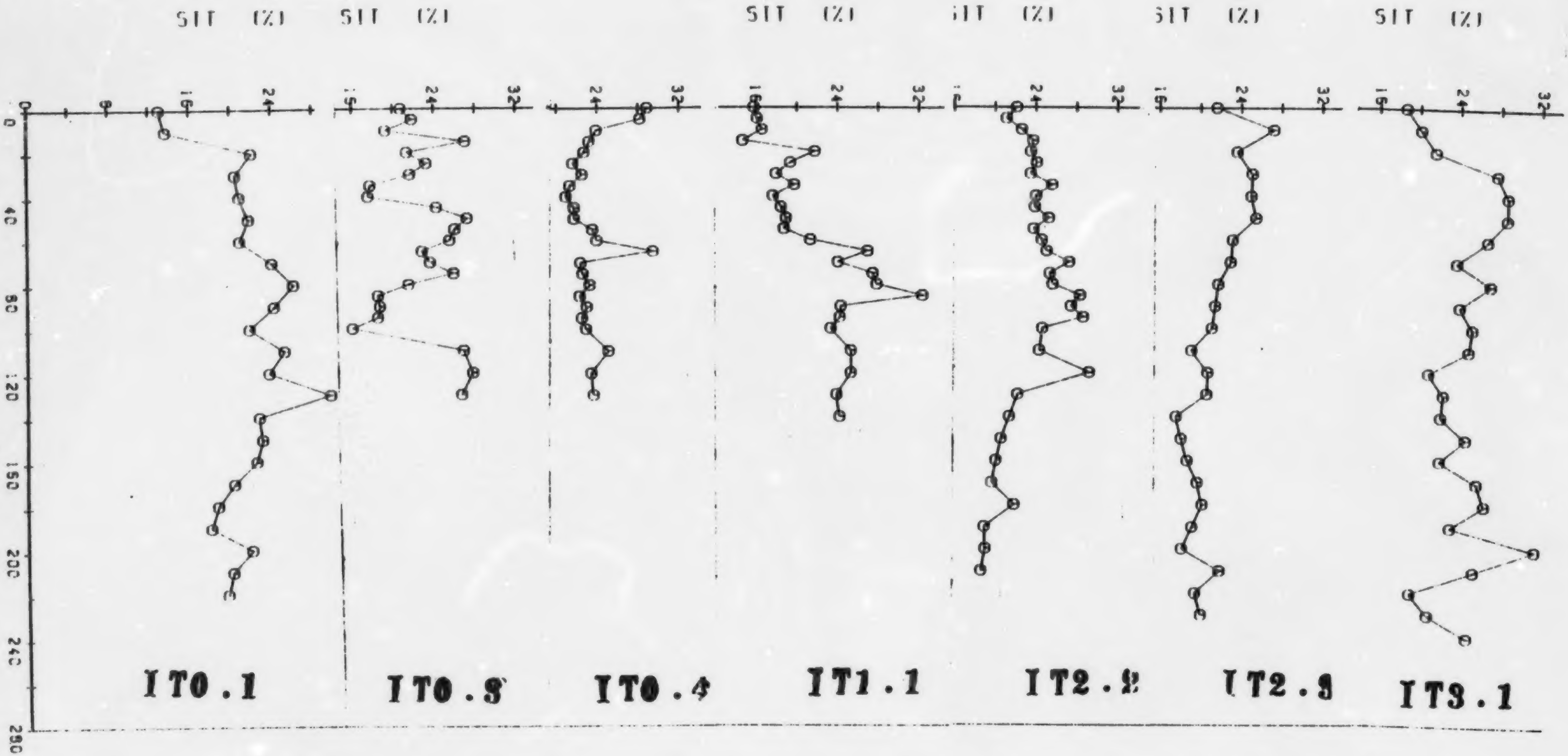


Fig. 10-33B. Total Silicon in 7 cores from Itirbilung Fjord

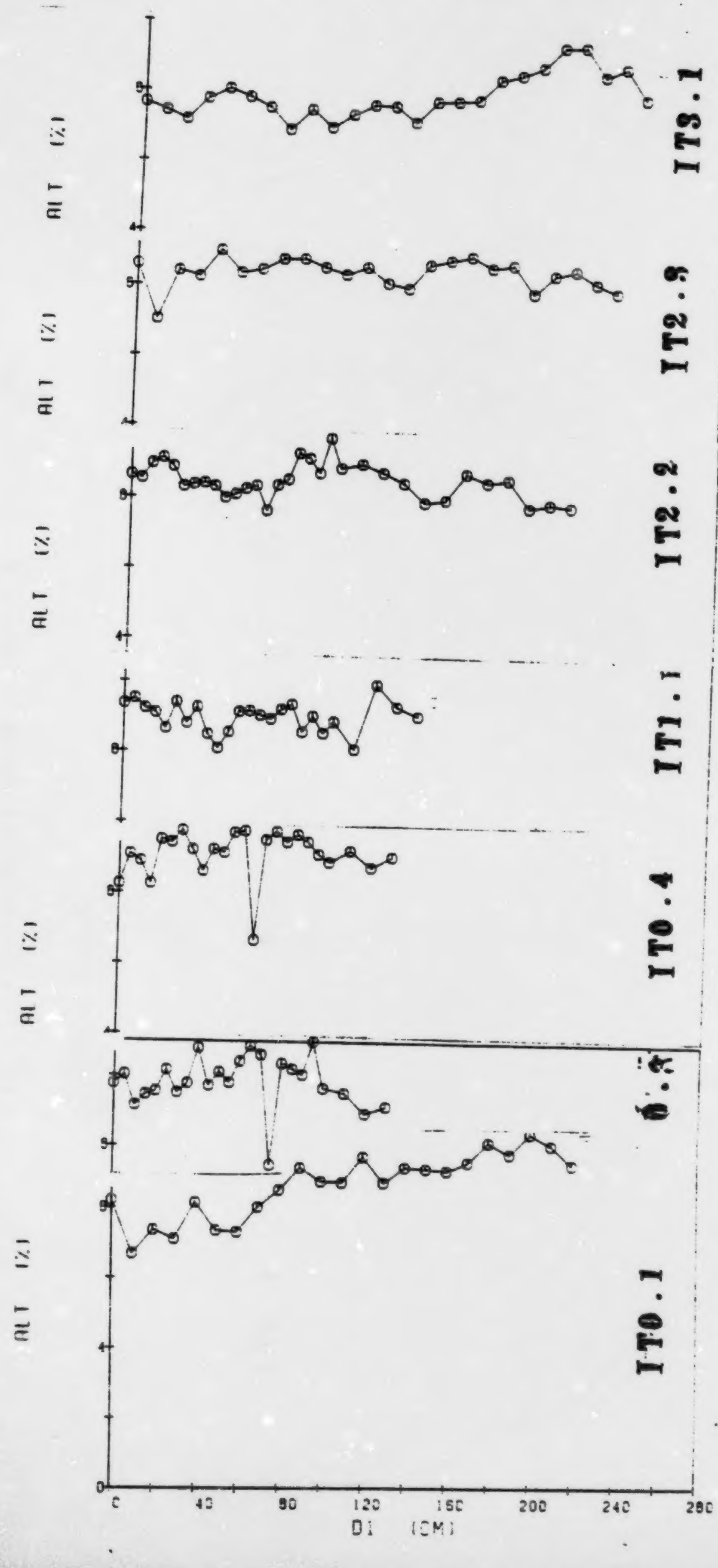


Fig. 10-34B. Total Aluminum in 7 cores from Itirbilung Fjord

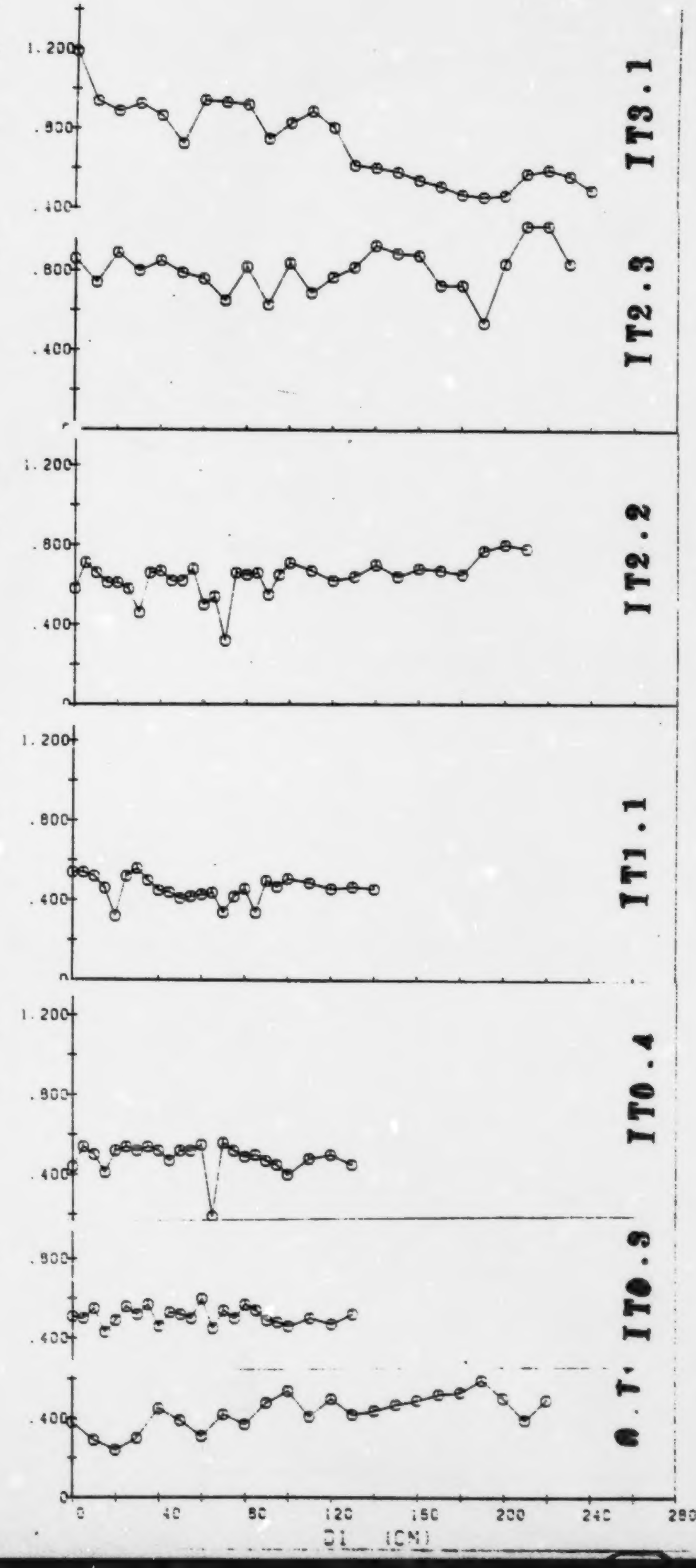


Fig. 10-35B. Total Carbon in 7 cores from Itirbilung Fjord

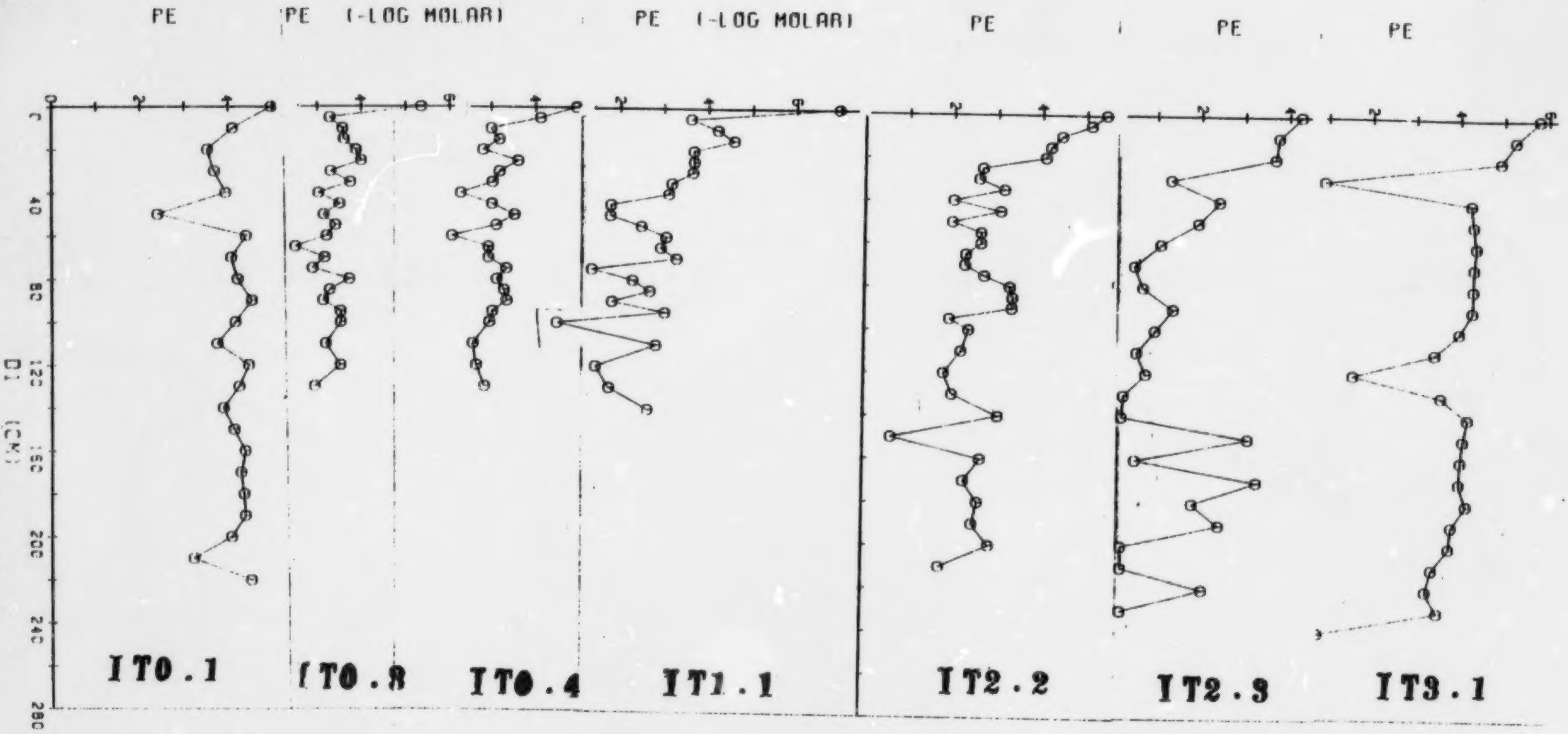


Fig. 10-36B. Redox potential in 7 cores from Itirbilung Fjord

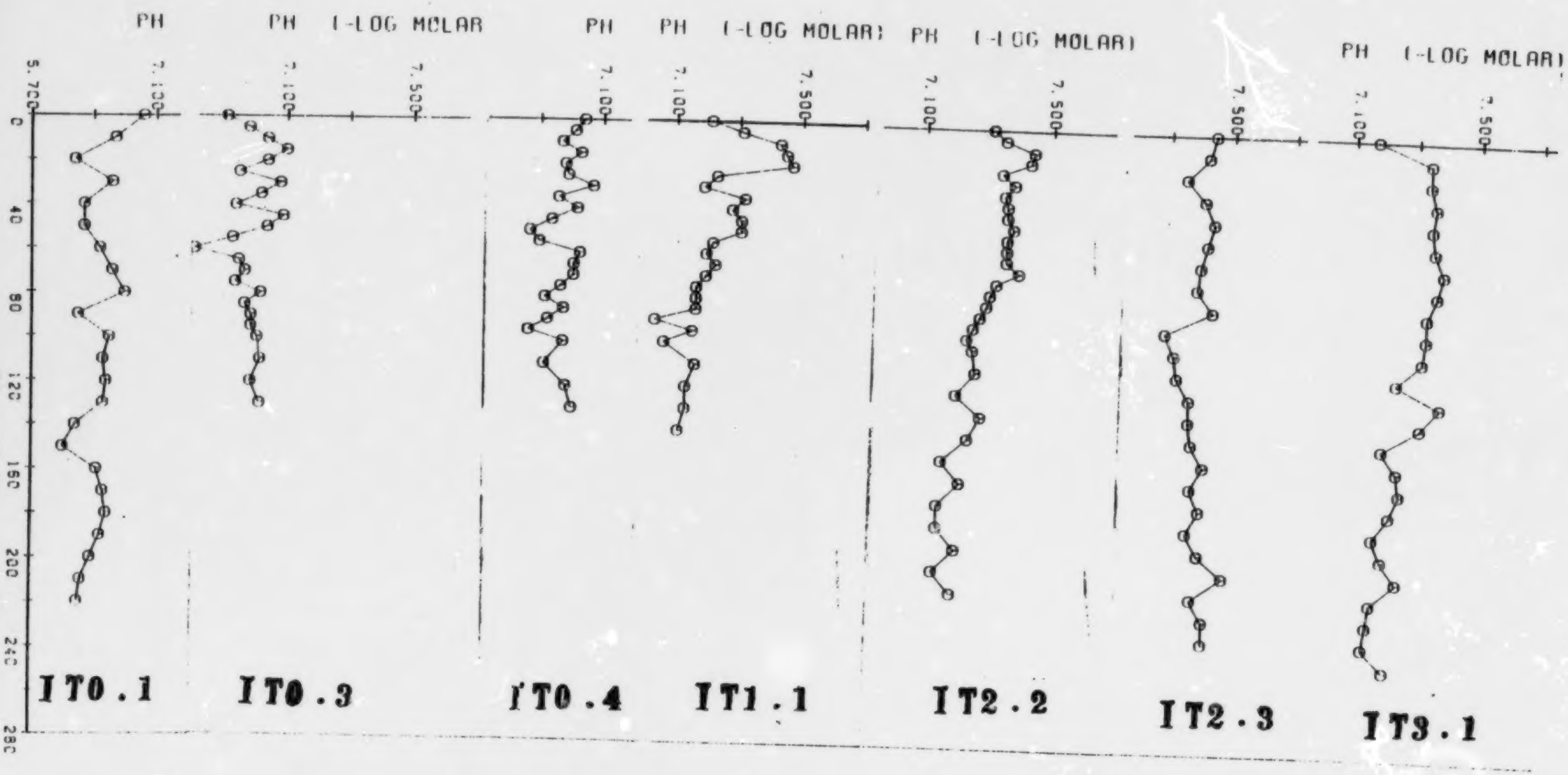


Fig. 10-37B. pH in 7 cores from Itirbilung Fjord

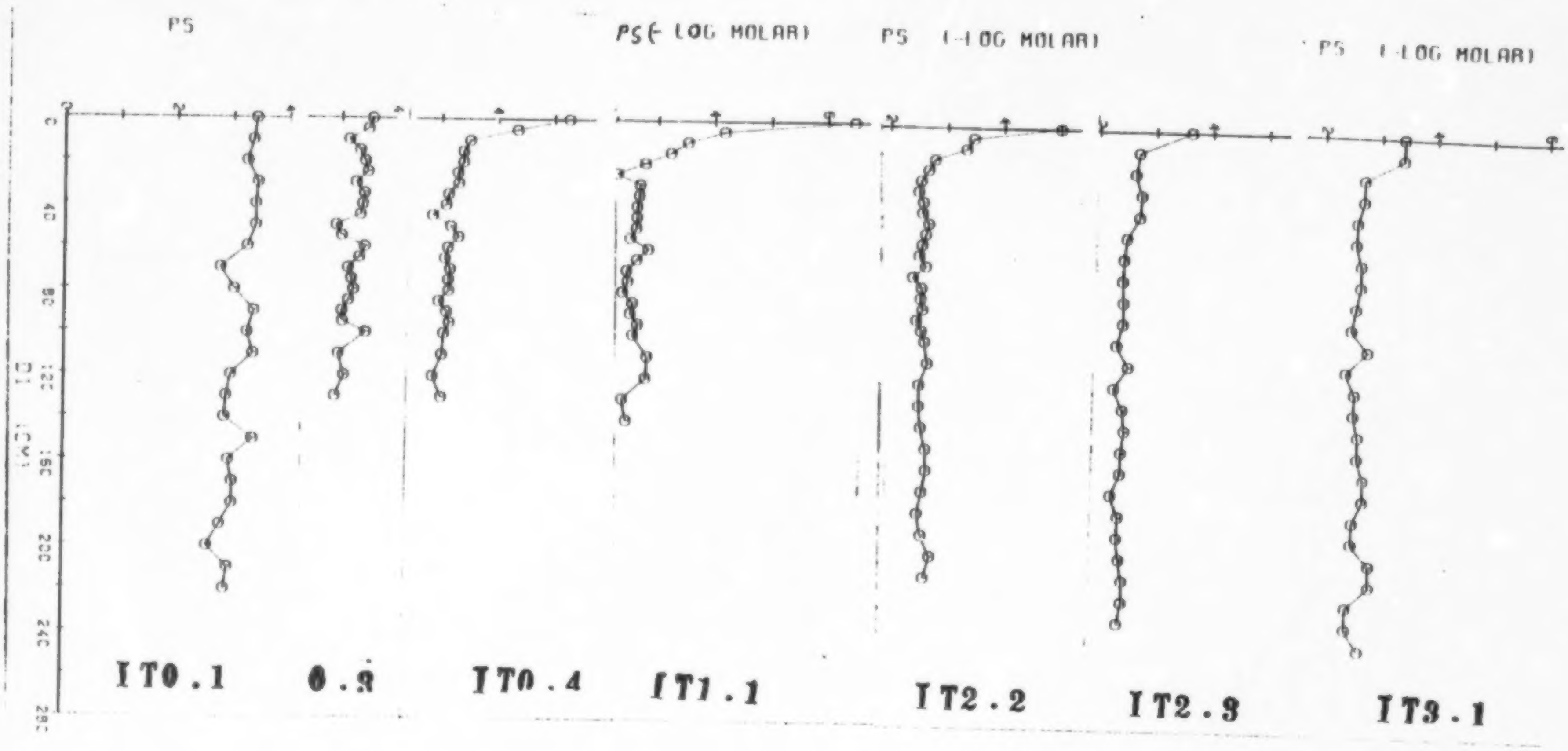


Fig. 10-38B. pS in 7 cores from Itirbilung Fjord

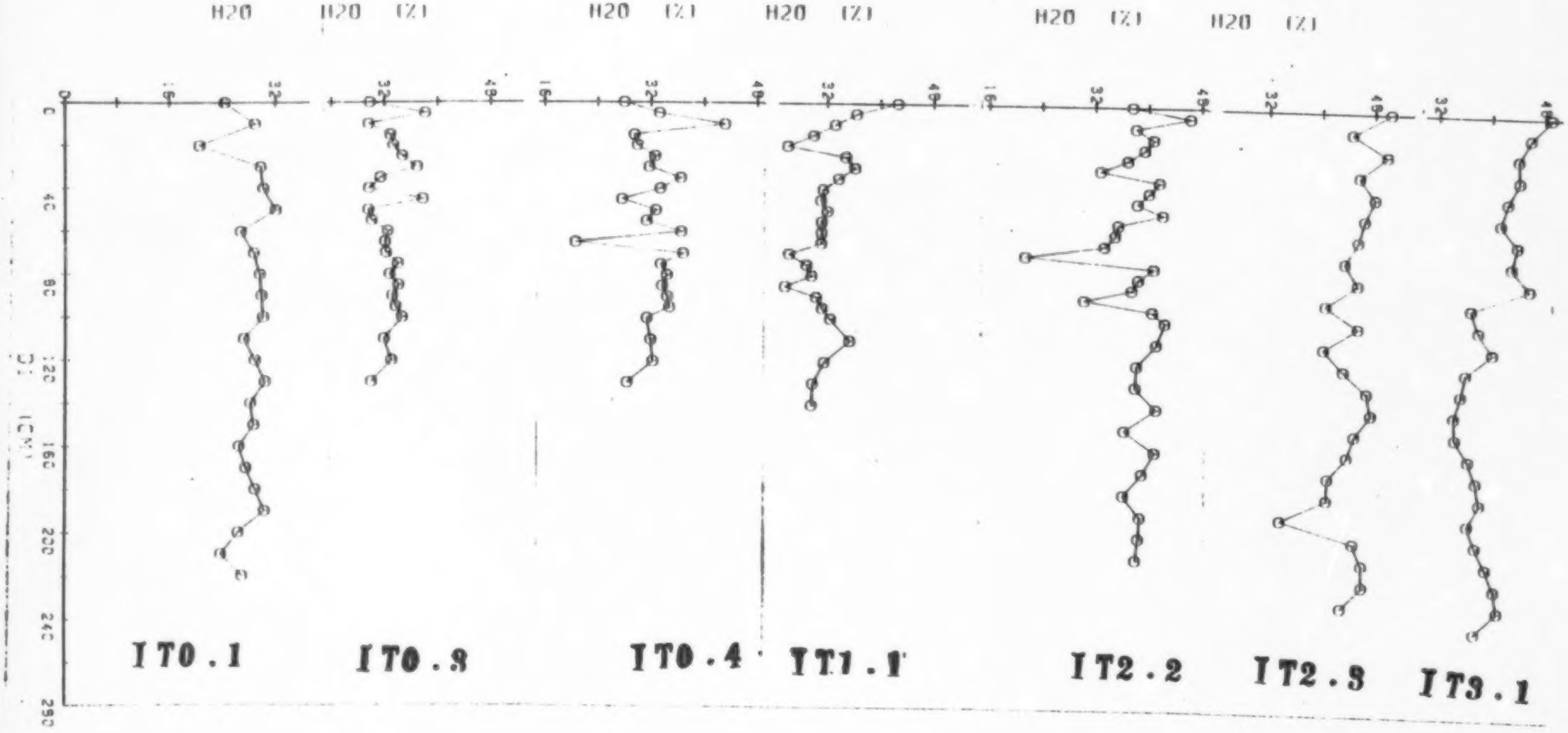


Fig. 10-39B. Moisture content in 7 cores from Itirbilung Fjord

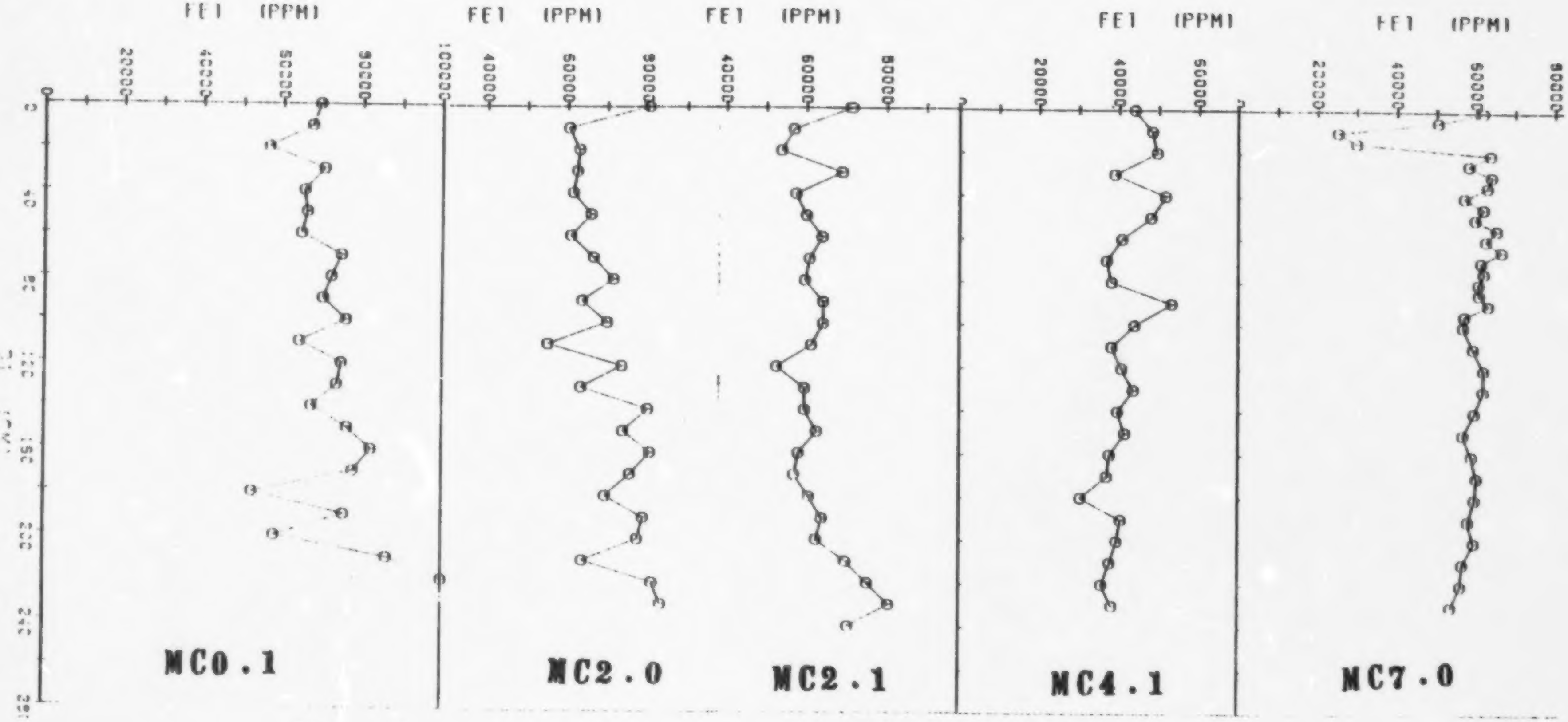


Fig. 10-1C Total Iron in 5 cores from McBeth Fjord

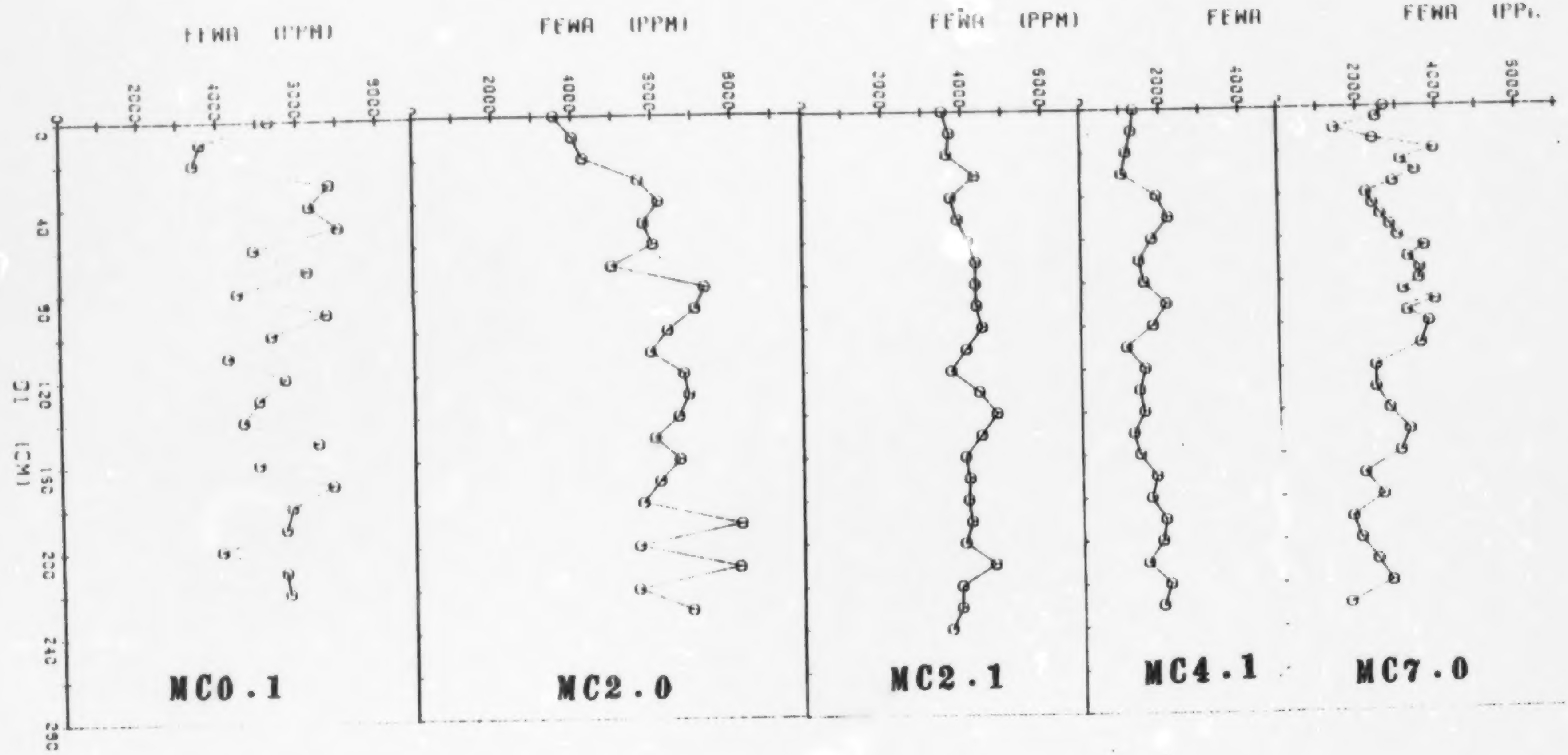
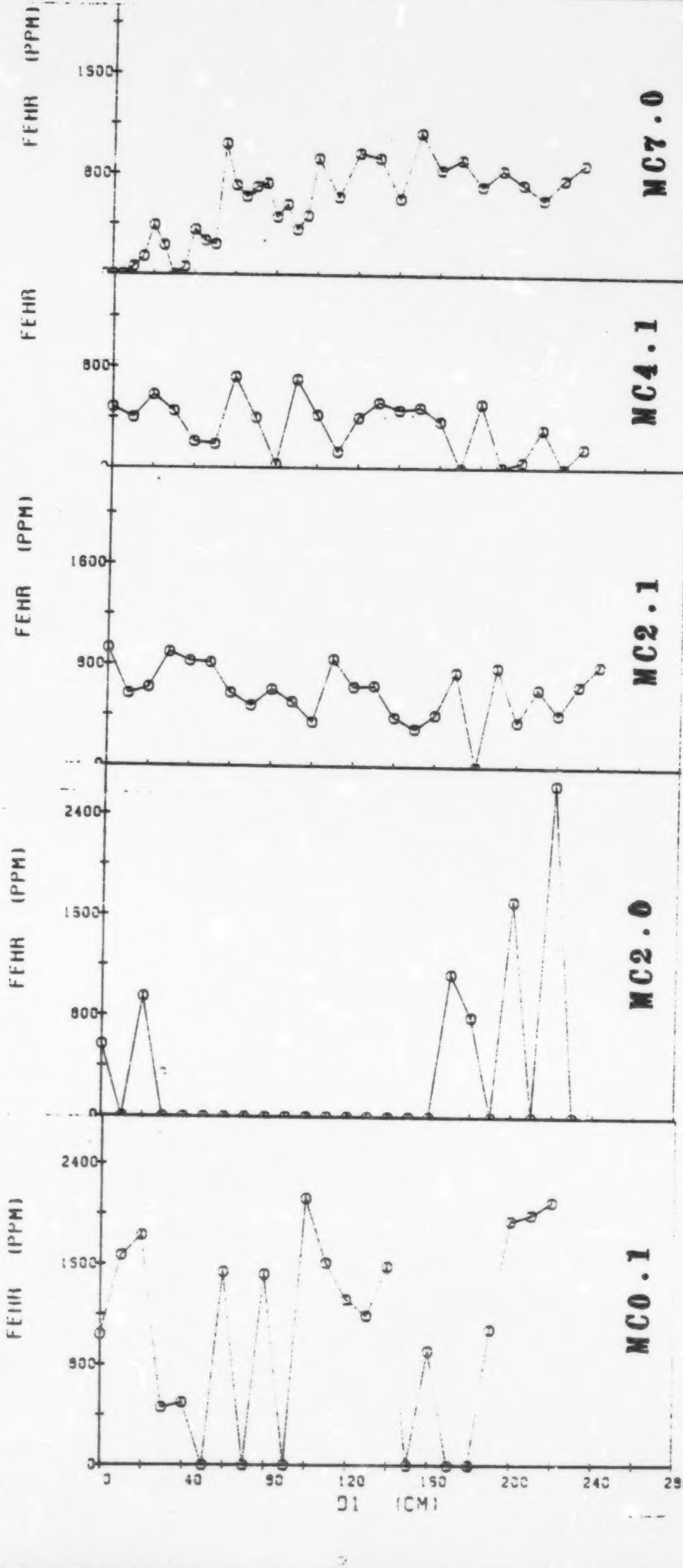


Fig. 10-2C Weak acid leachable Iron in 5 cores from McBeth Fjord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280
D1 (CM)

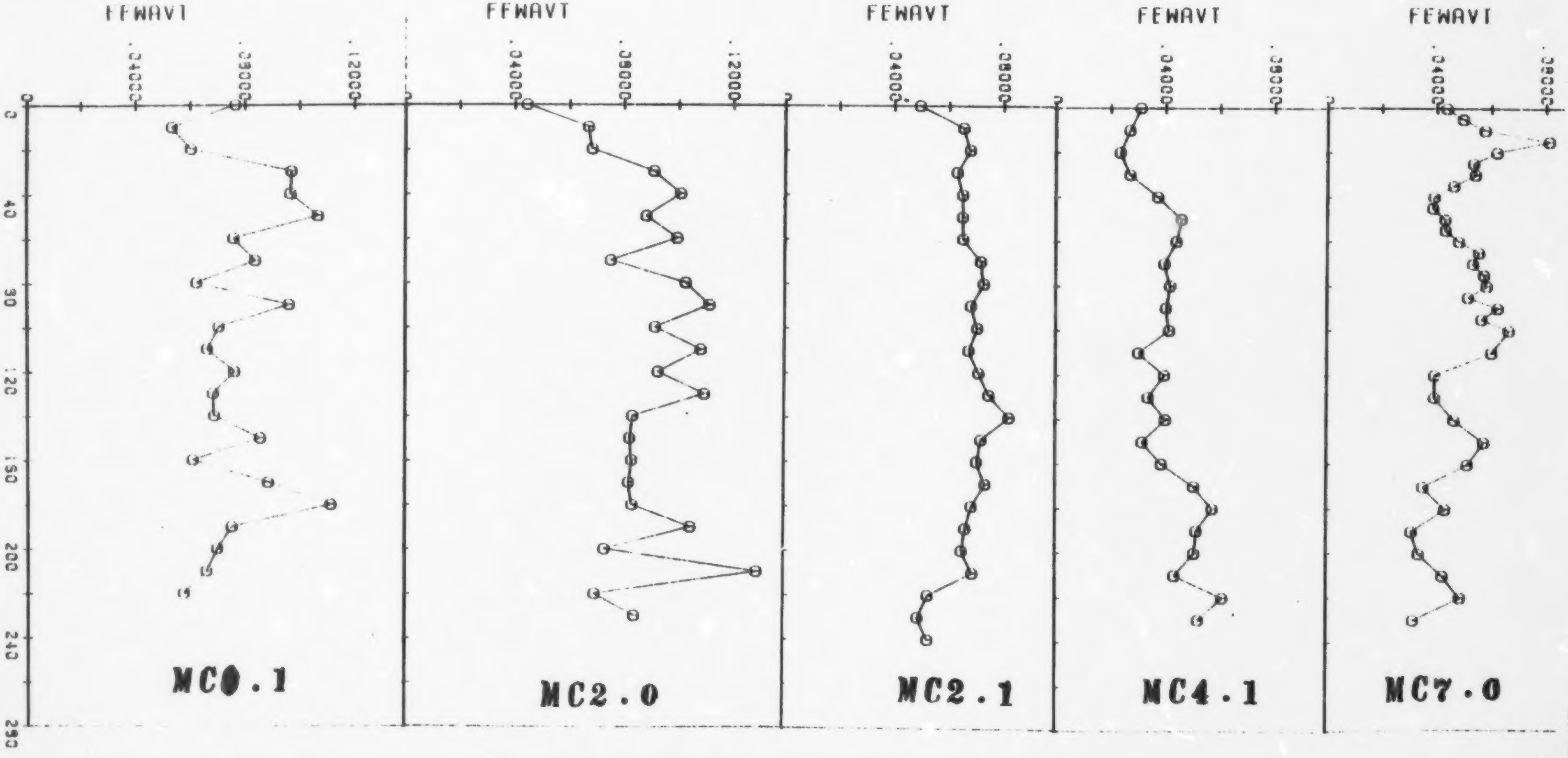
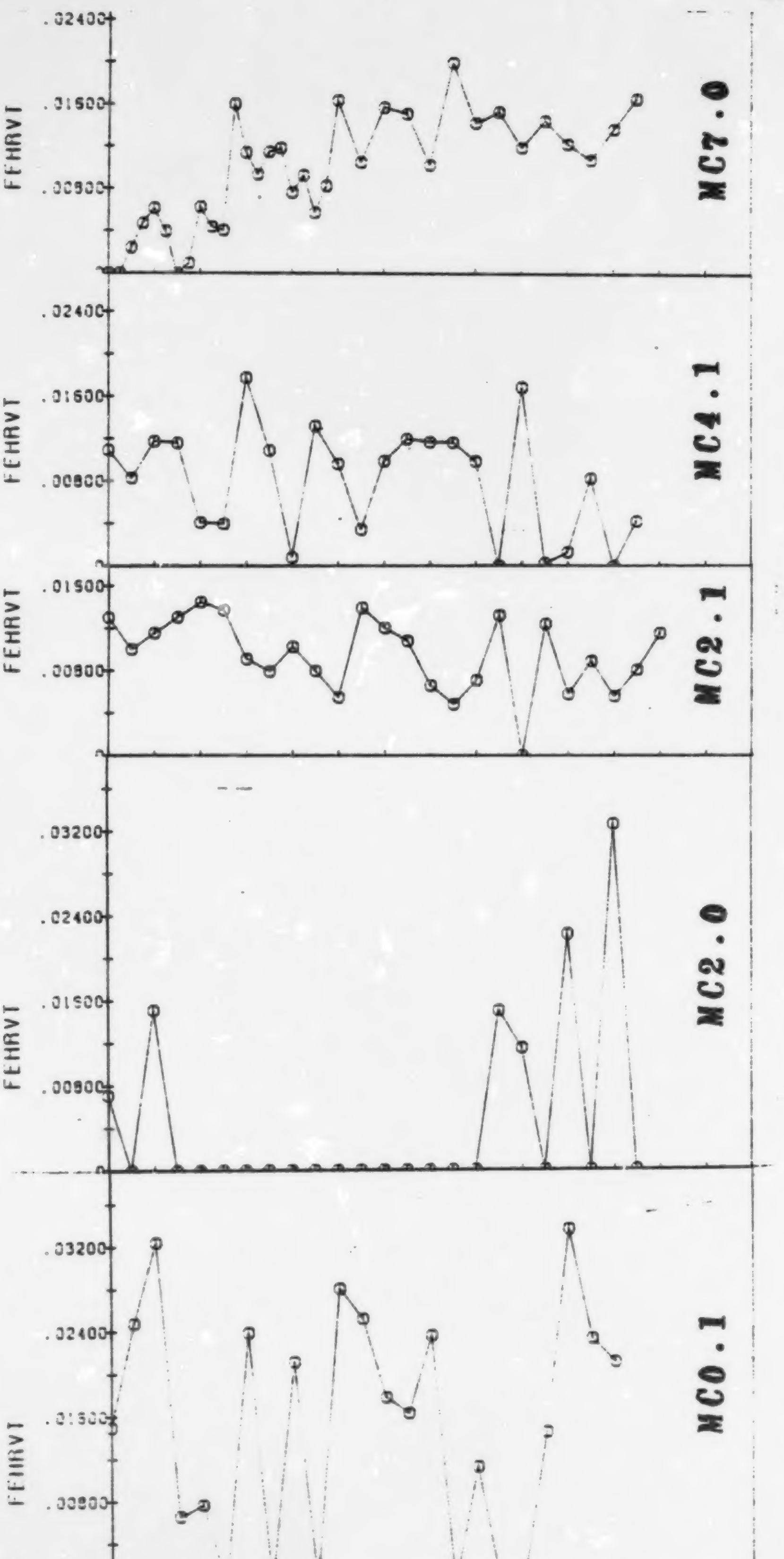


Fig. 10-4C Ratio of weak acid leachable Iron/total Iron in 5 cores from McBeth Fjord


MC7.0
MC4.1
MC2.1
MC2.0
MC0.1
FEHRVT
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.00800
0
.01500
.03200
0
40
80
120
160
200
240
280
DI (CM)

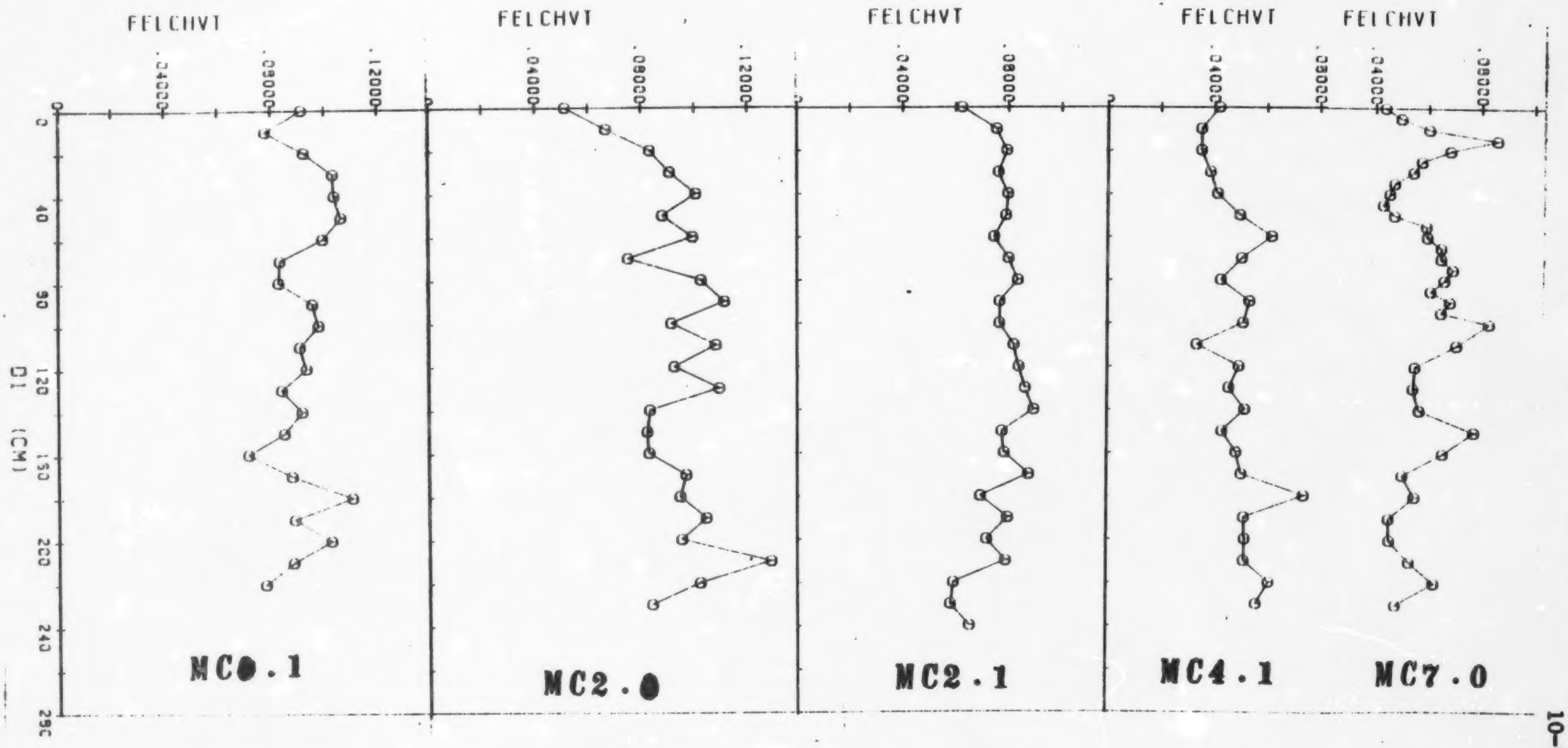

Fig. 10-6C Ratio of labile Iron/total Iron ~~in 5 cores from McBeth Fjord~~

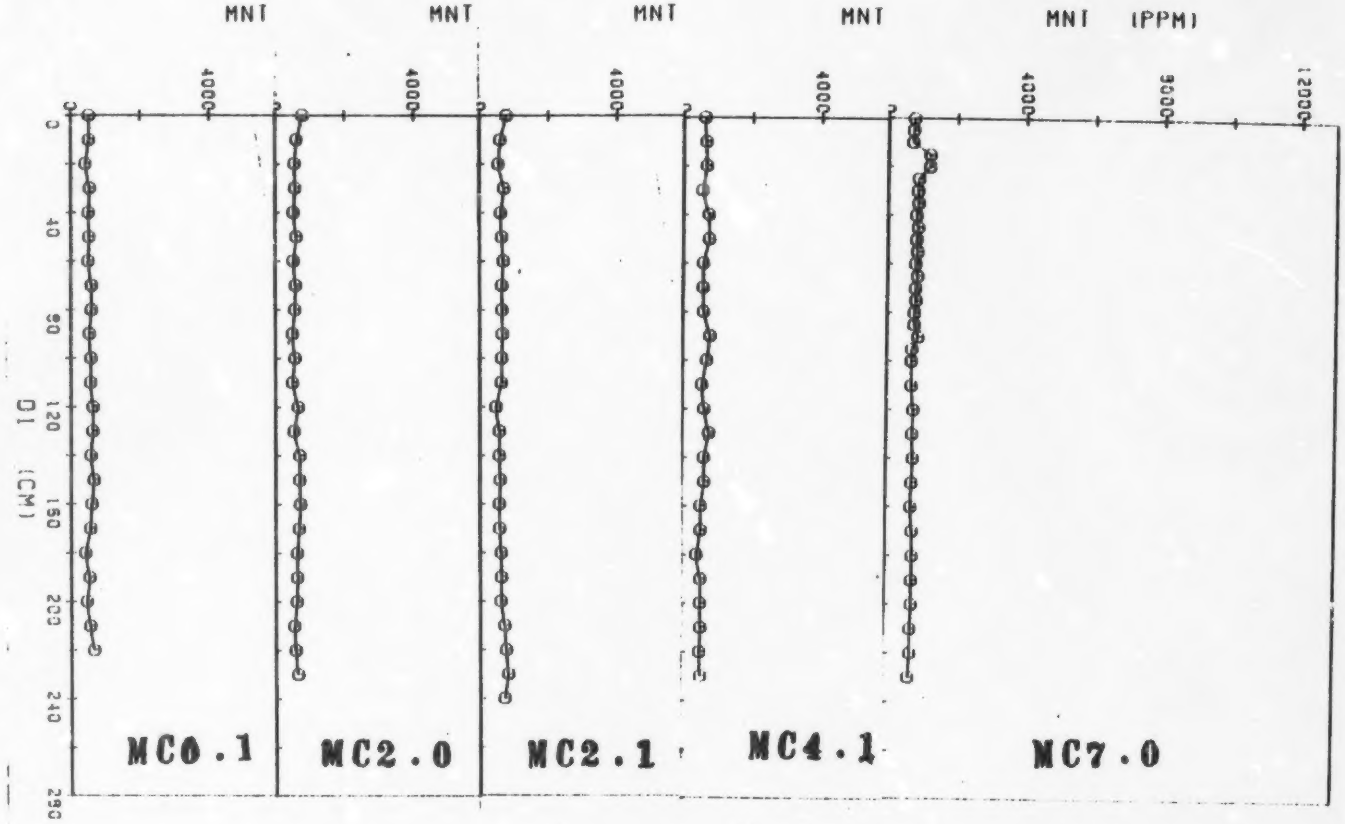

Fig. 10-7C Total Manganese in 5 cores from McBeth Fjord

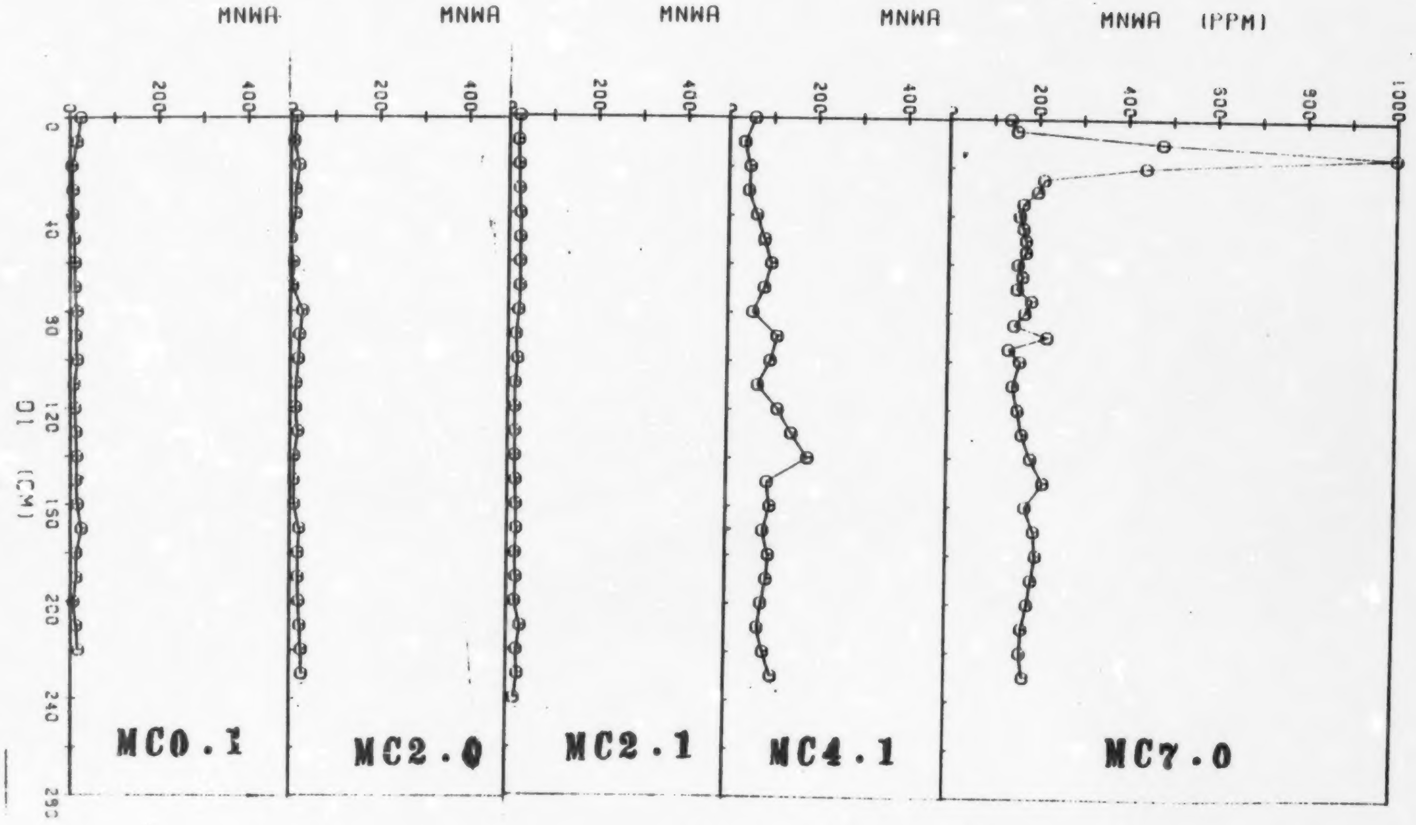

Fig. 10-8C Weak acid leachable Manganese in 5 cores from McBeth Fjord

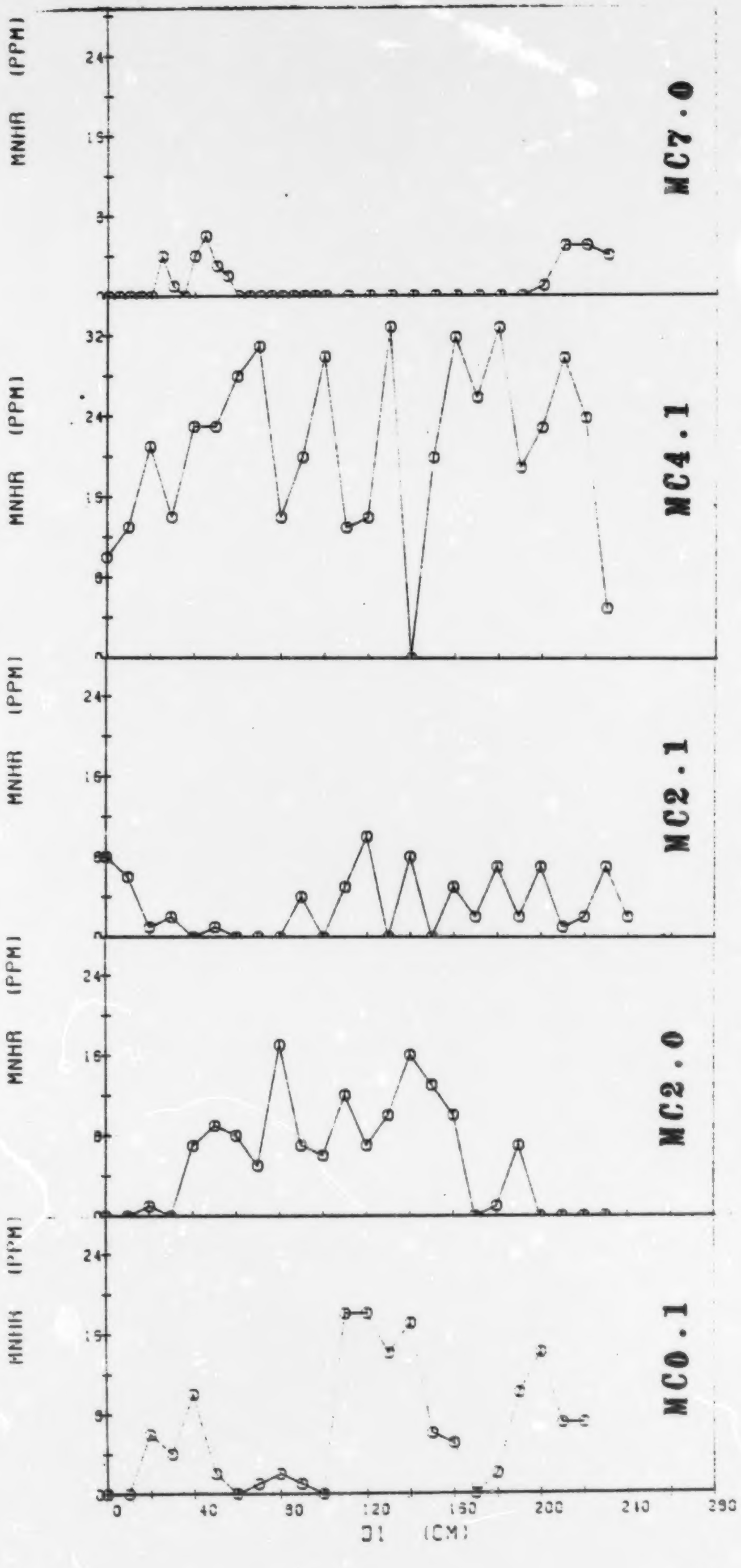

Fig. 10-9C Reducible fraction of Manganese in 5 cores from McBeth Fjord

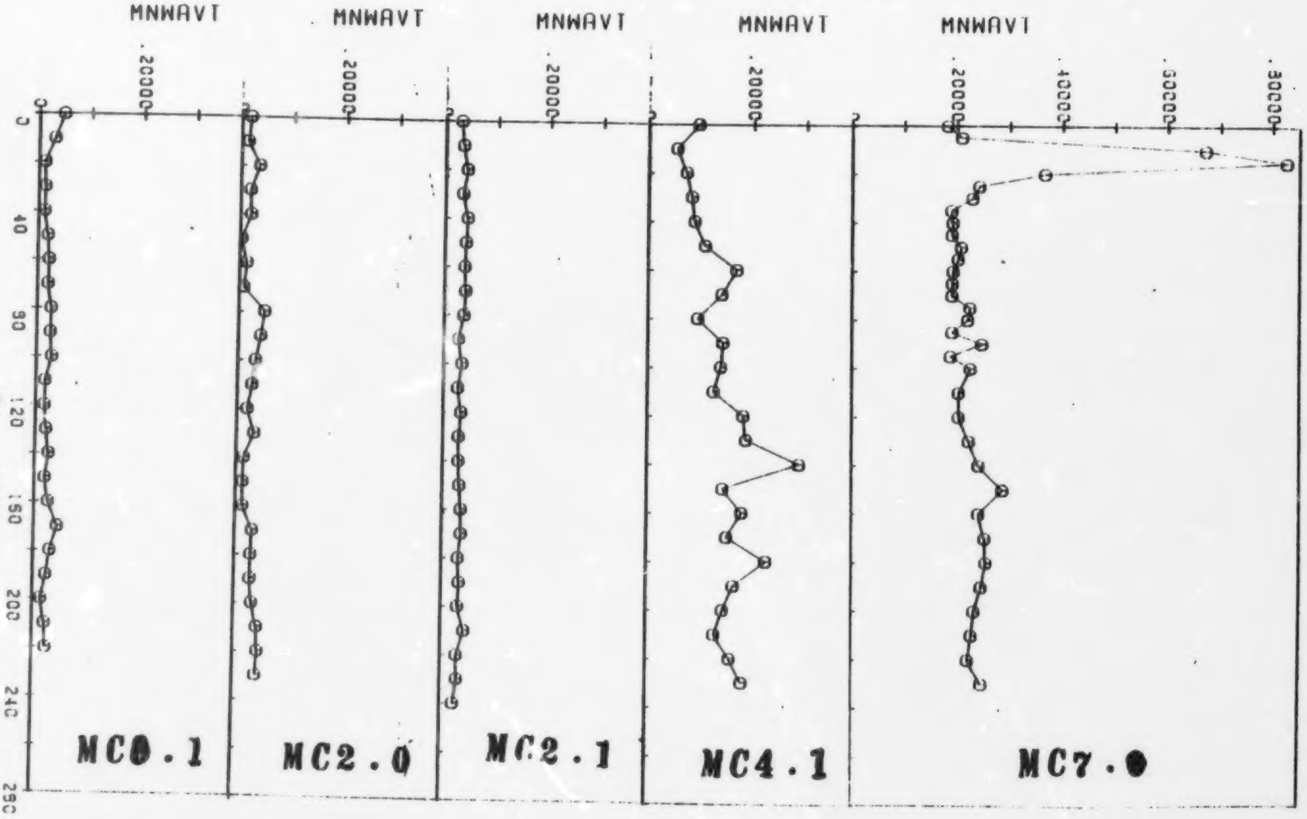

Fig. 10-10C Weak acid leachable Manganese/total Manganese in 5 cores from McBeth Fjord

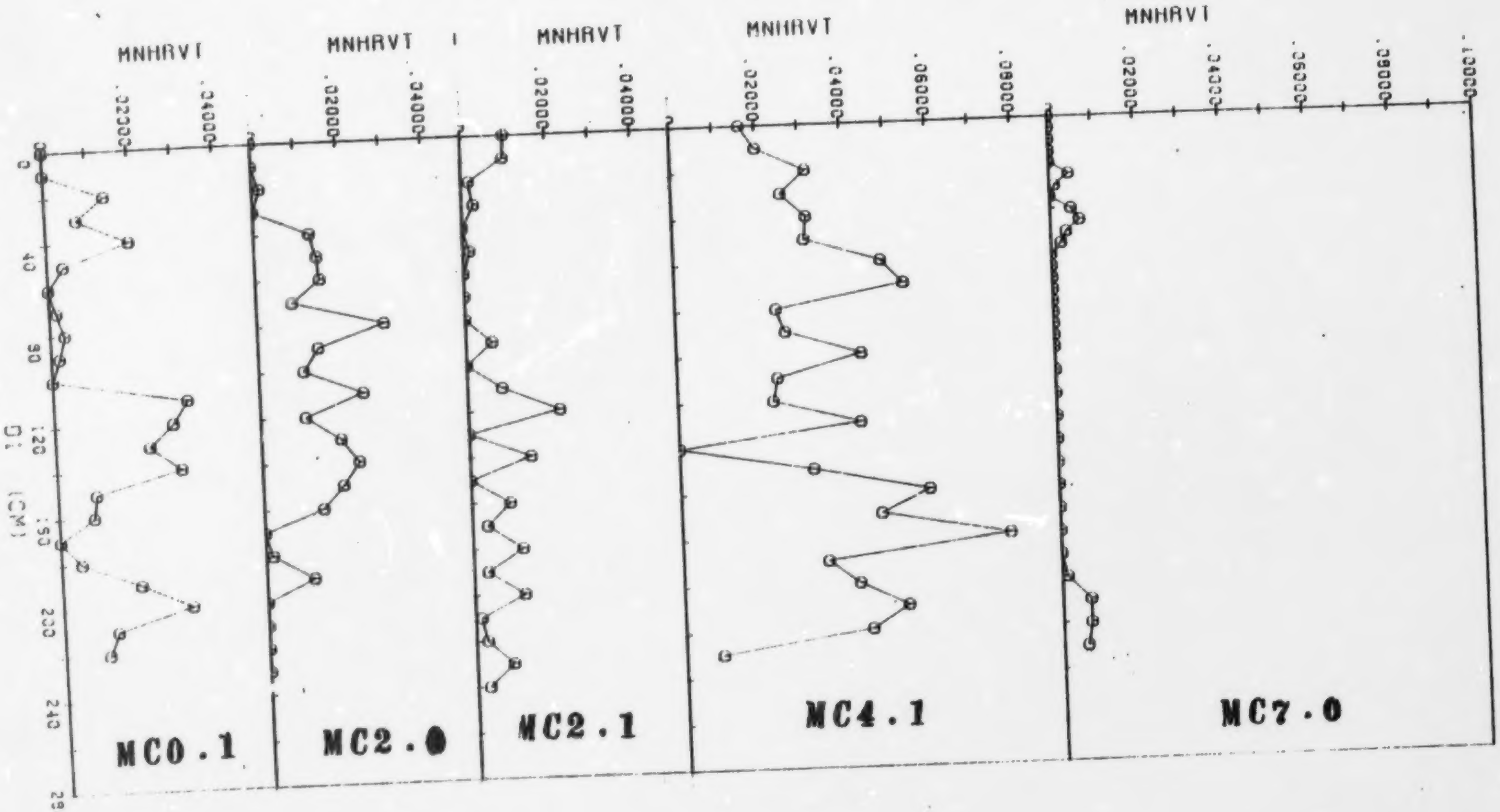

Fig. 10-11C Ratio of reducible Manganese/total Manganese in 5 cores from McBeth Fjord

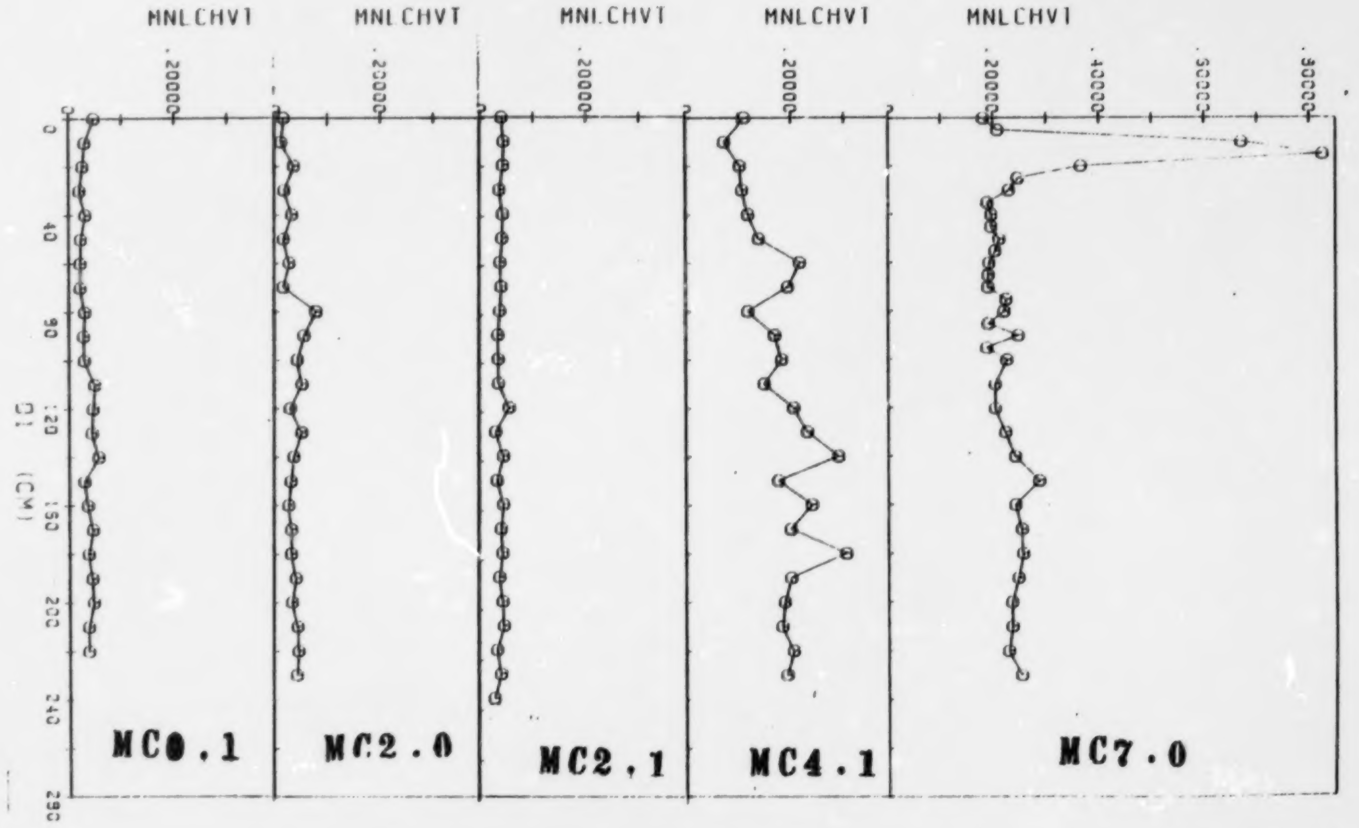

Fig. 10-12C Ratio of labile Manganese/total Manganese in 5 cores from McBeth Fjord

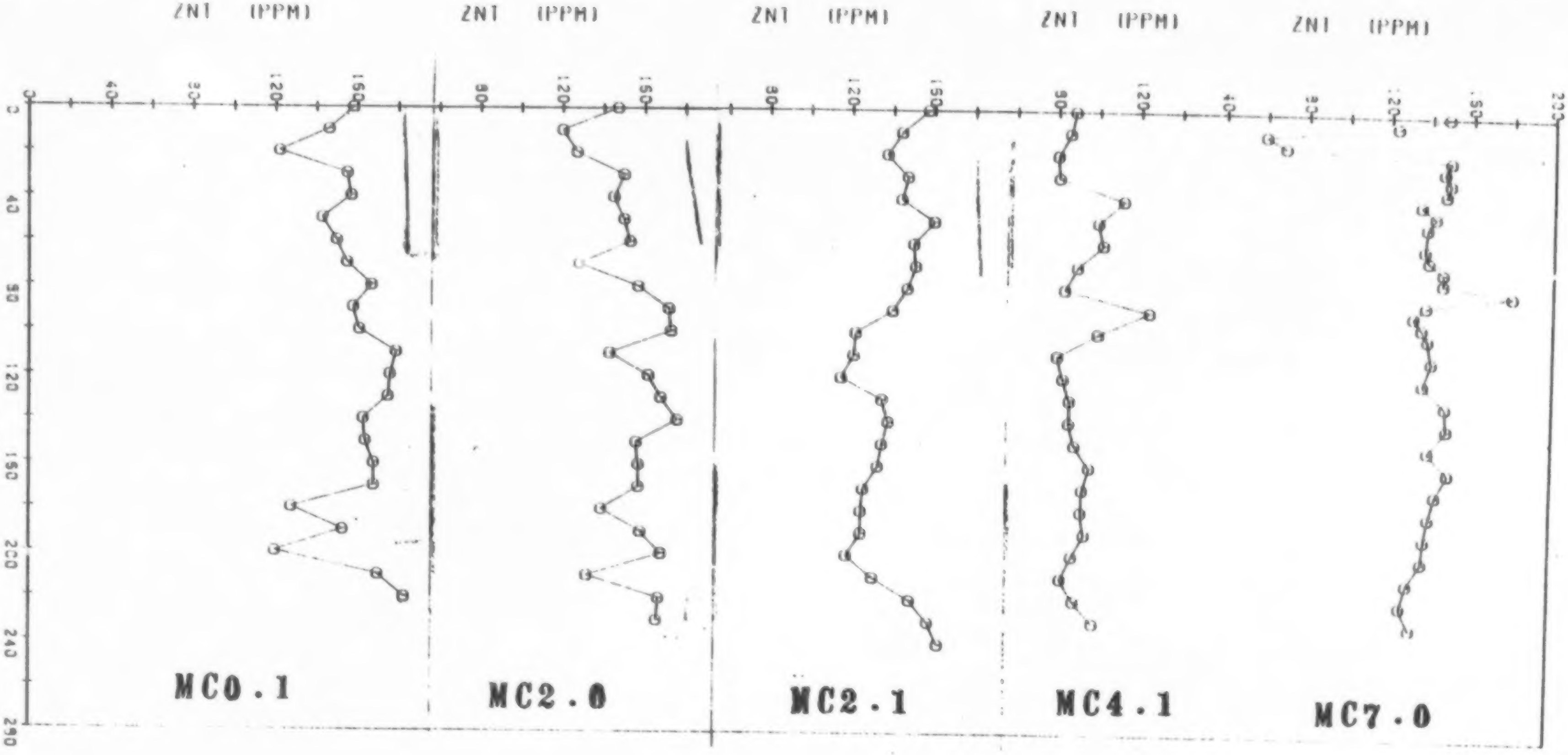

Fig. 10-13C Total Zinc in 5 cores from McBeth Fjord

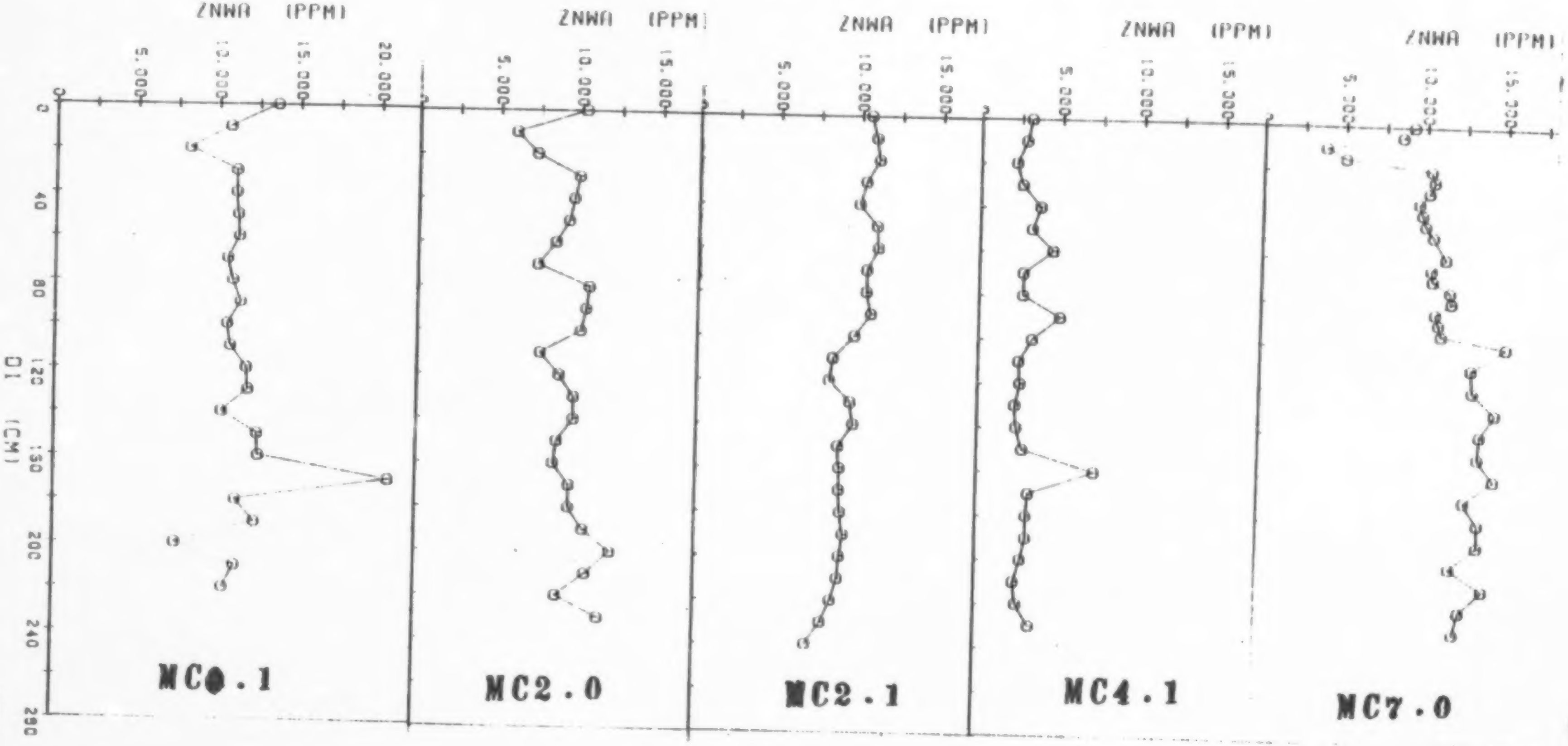

Fig. 10-14C Weak acid leachable Zinc in 5 cores from McBeth Fjord

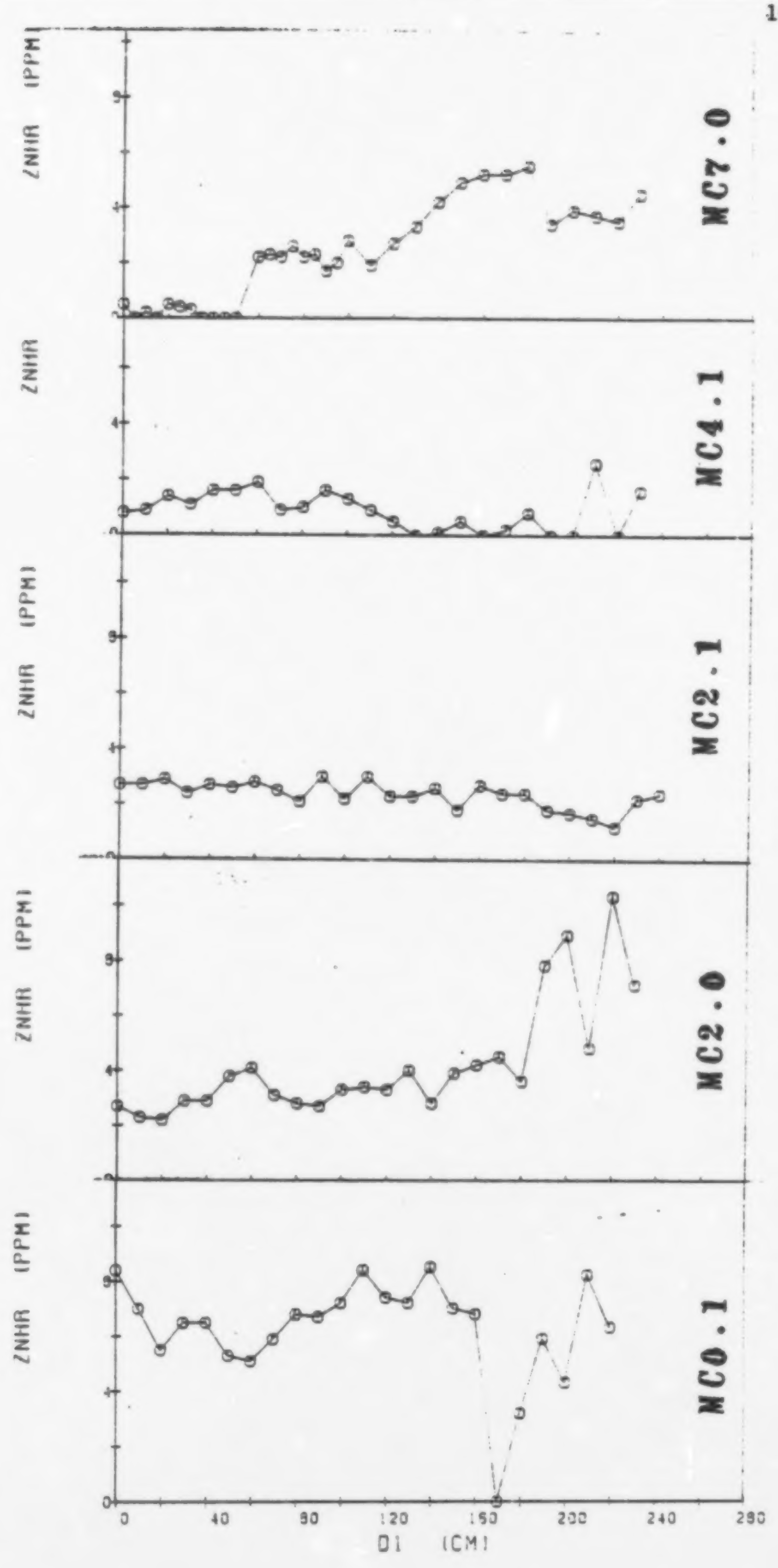

Fig. 10-15C Reducible fraction of Zinc in 5 cores from McBeth Fjord

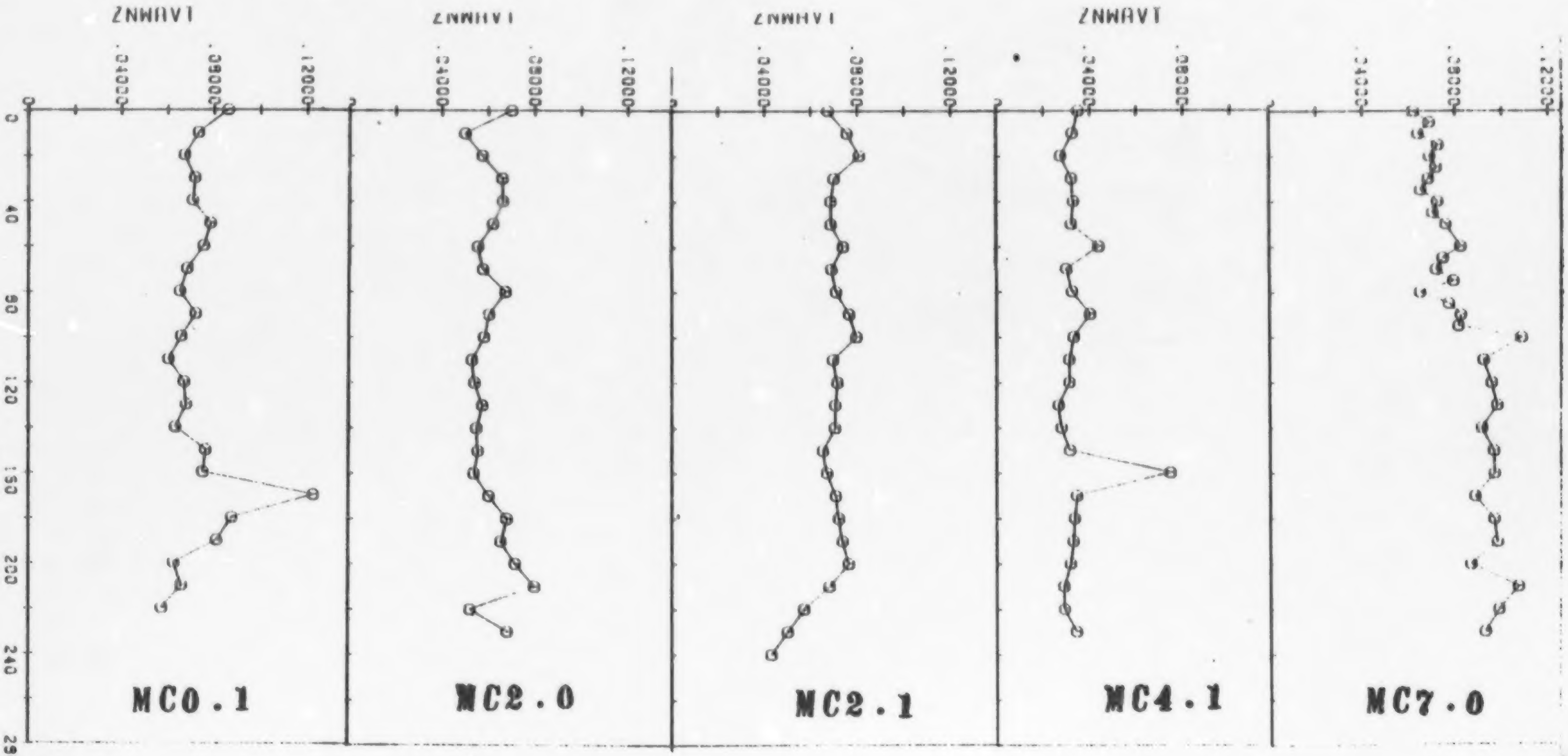

Fig. 10-16C Ratio of weak acid leachable Zinc/total Zinc in 5 cores from McBeth Fjord

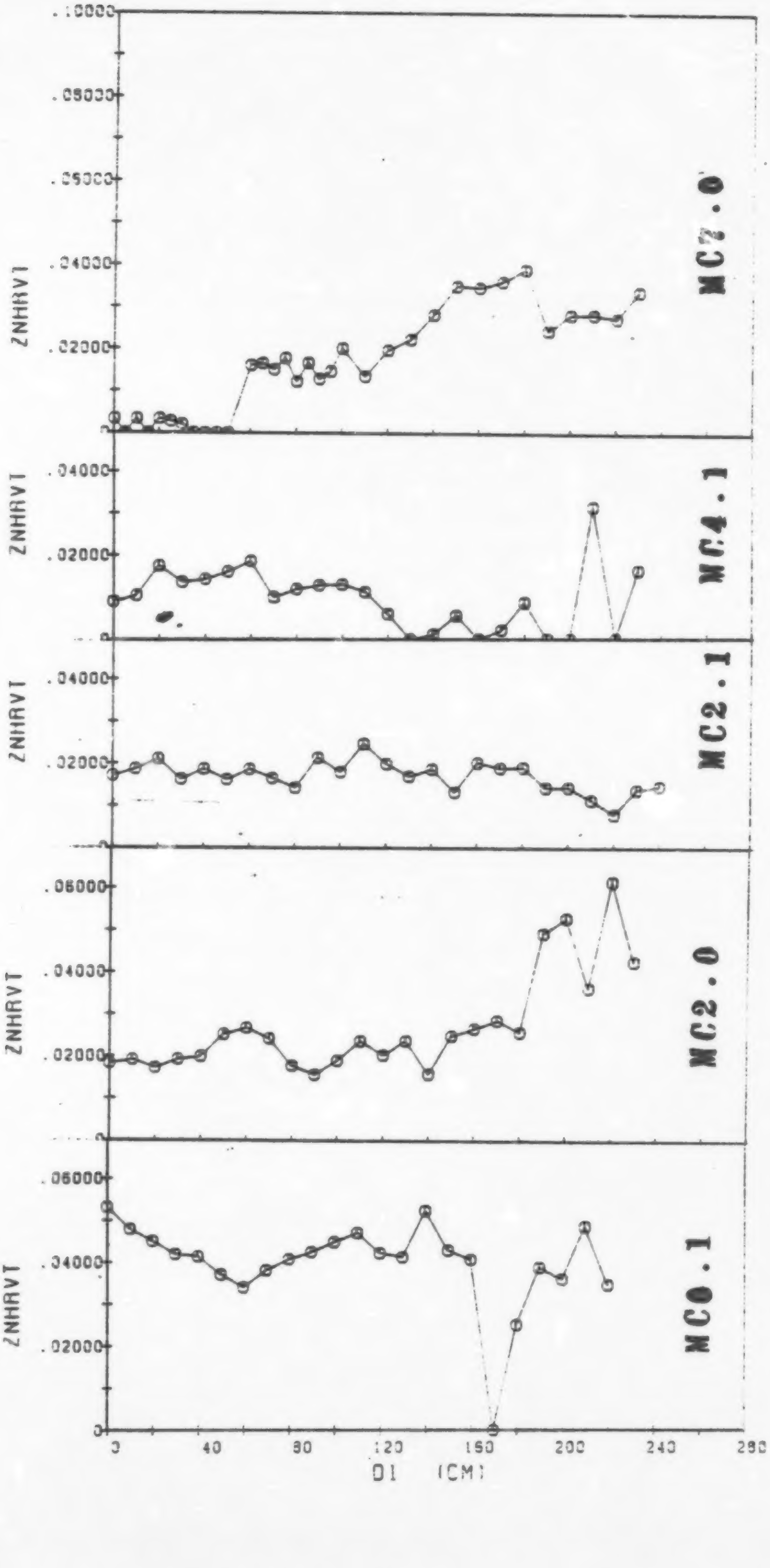

Fig. 10-17C Ratio of reducible Zinc/total Zinc in 5 cores from McBeth Fjord

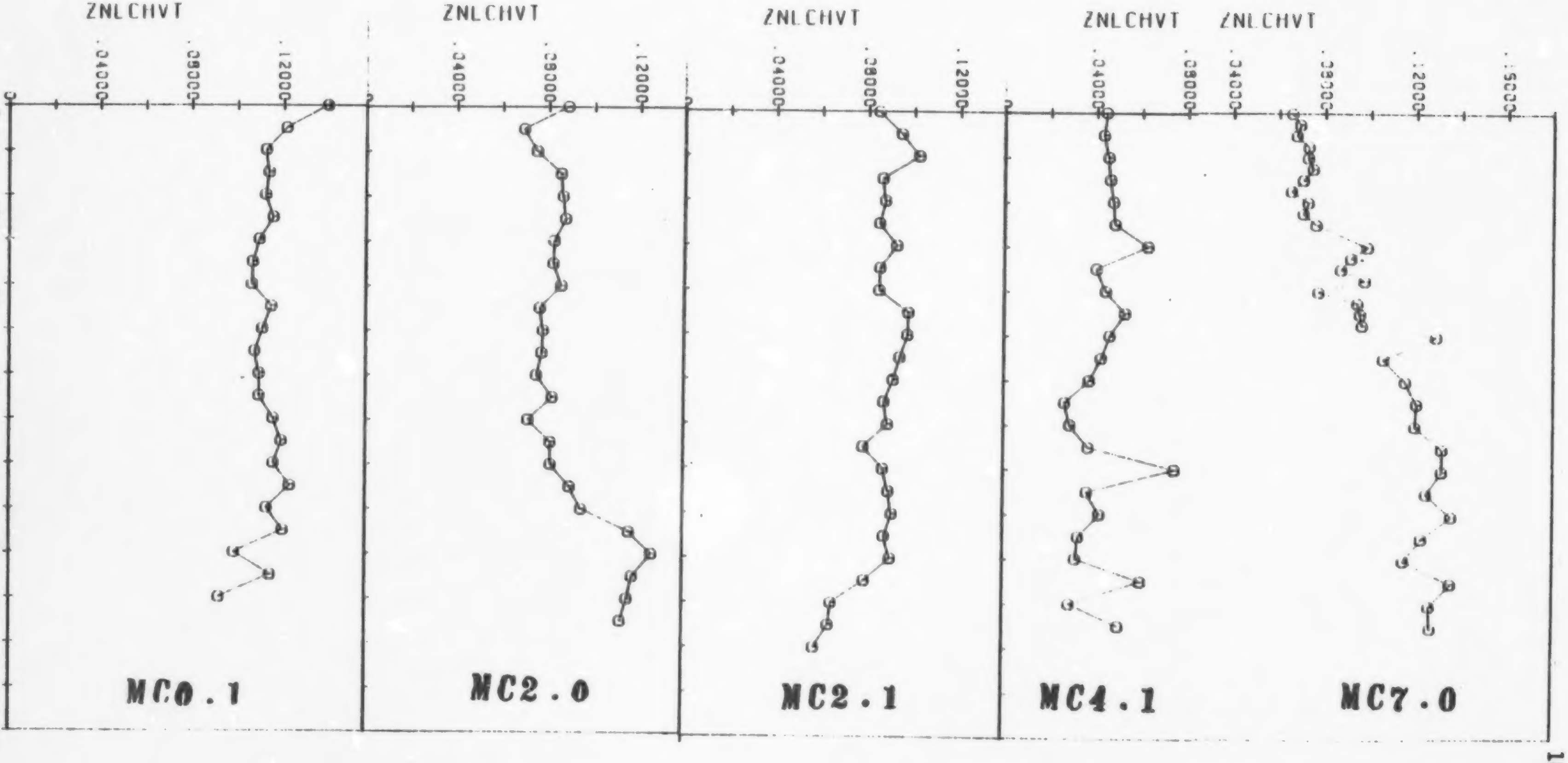

Fig. 10-18C Ratio of labile Zinc/total Zinc in 5 cores from McBeth Fjord

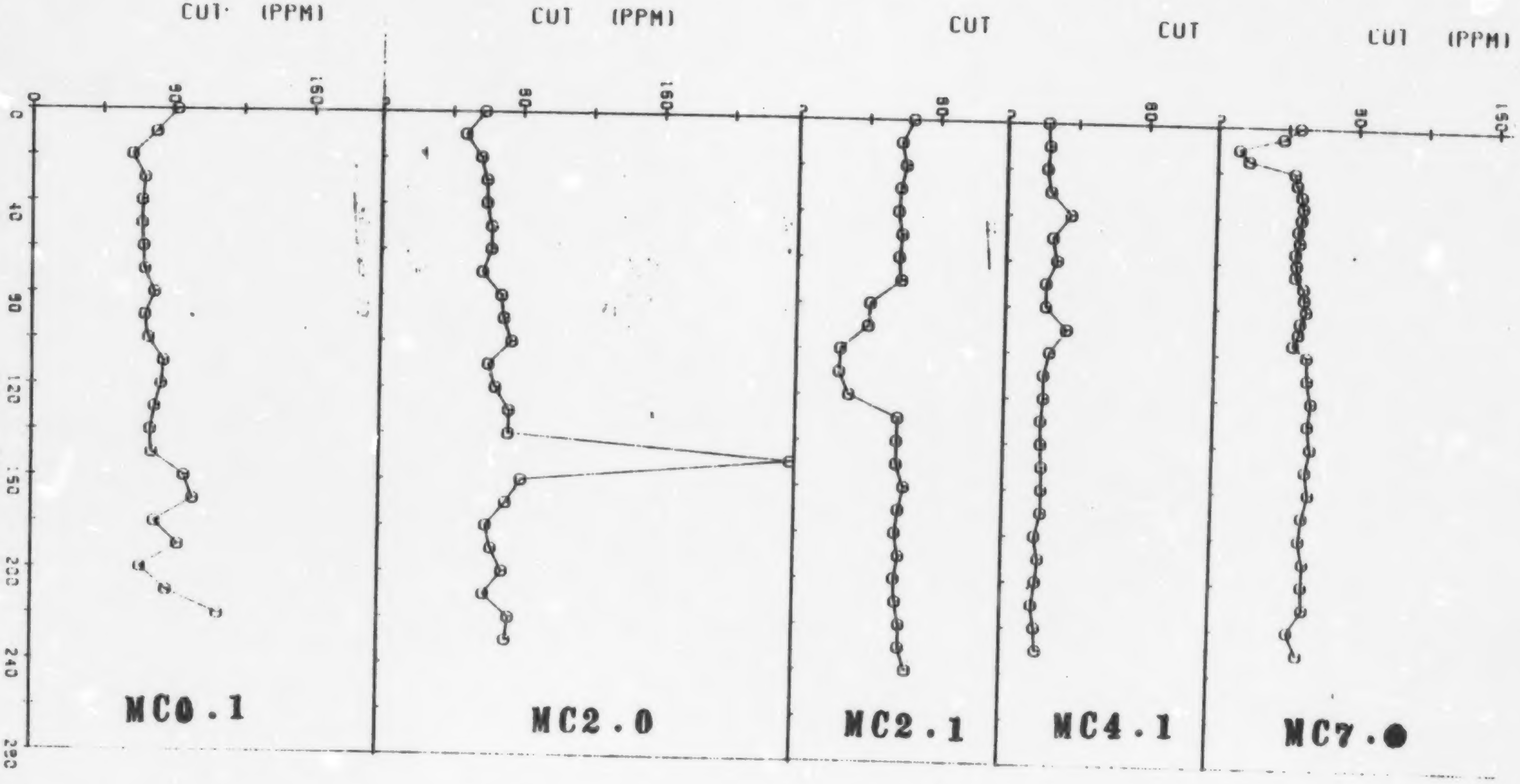

Fig. 10-196. Total Copper in 5 cores from McBeth Fiord

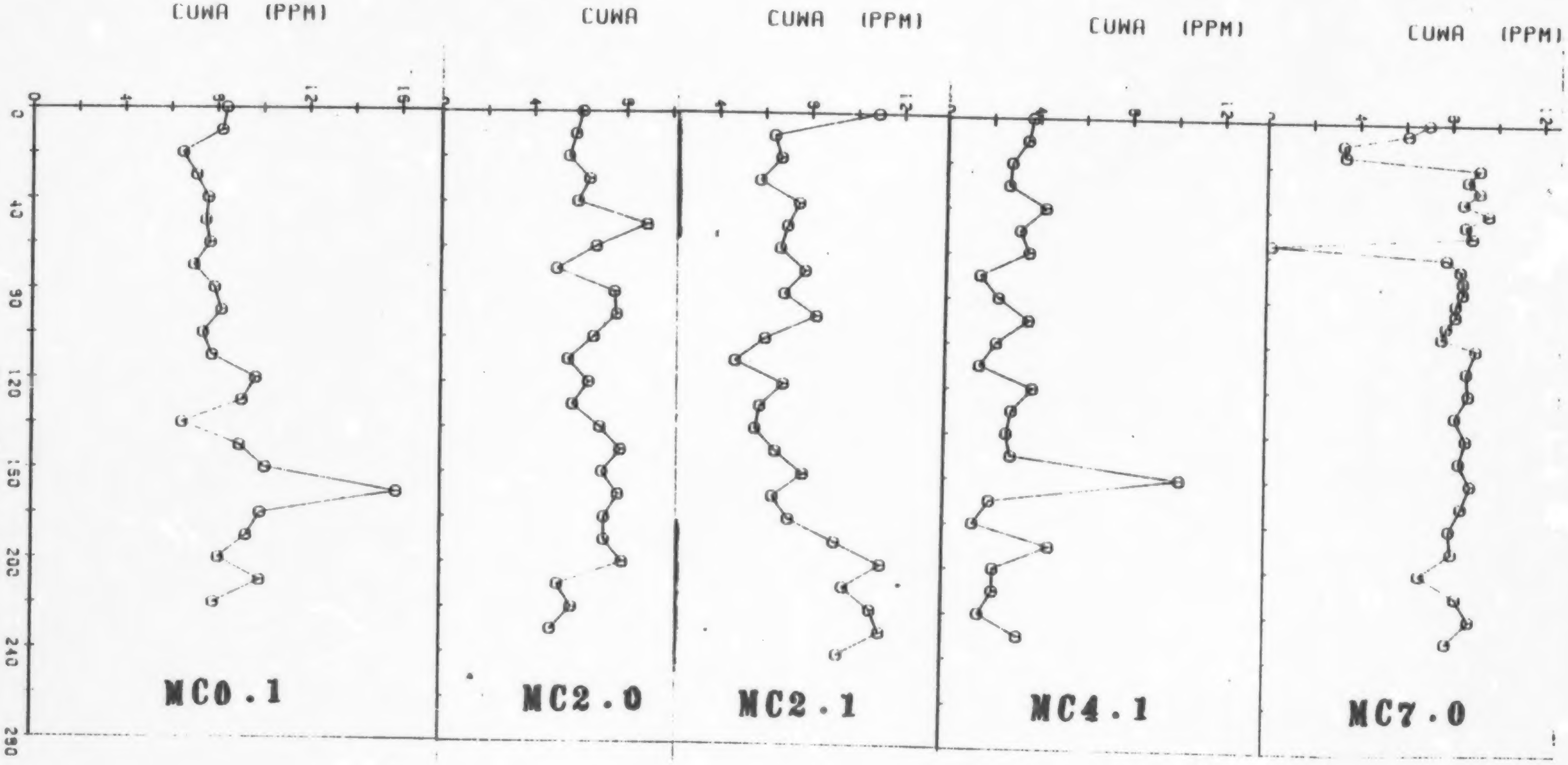

Fig. 10-20C Weak acid leachable Copper in 5 cores from McBeth Fjord

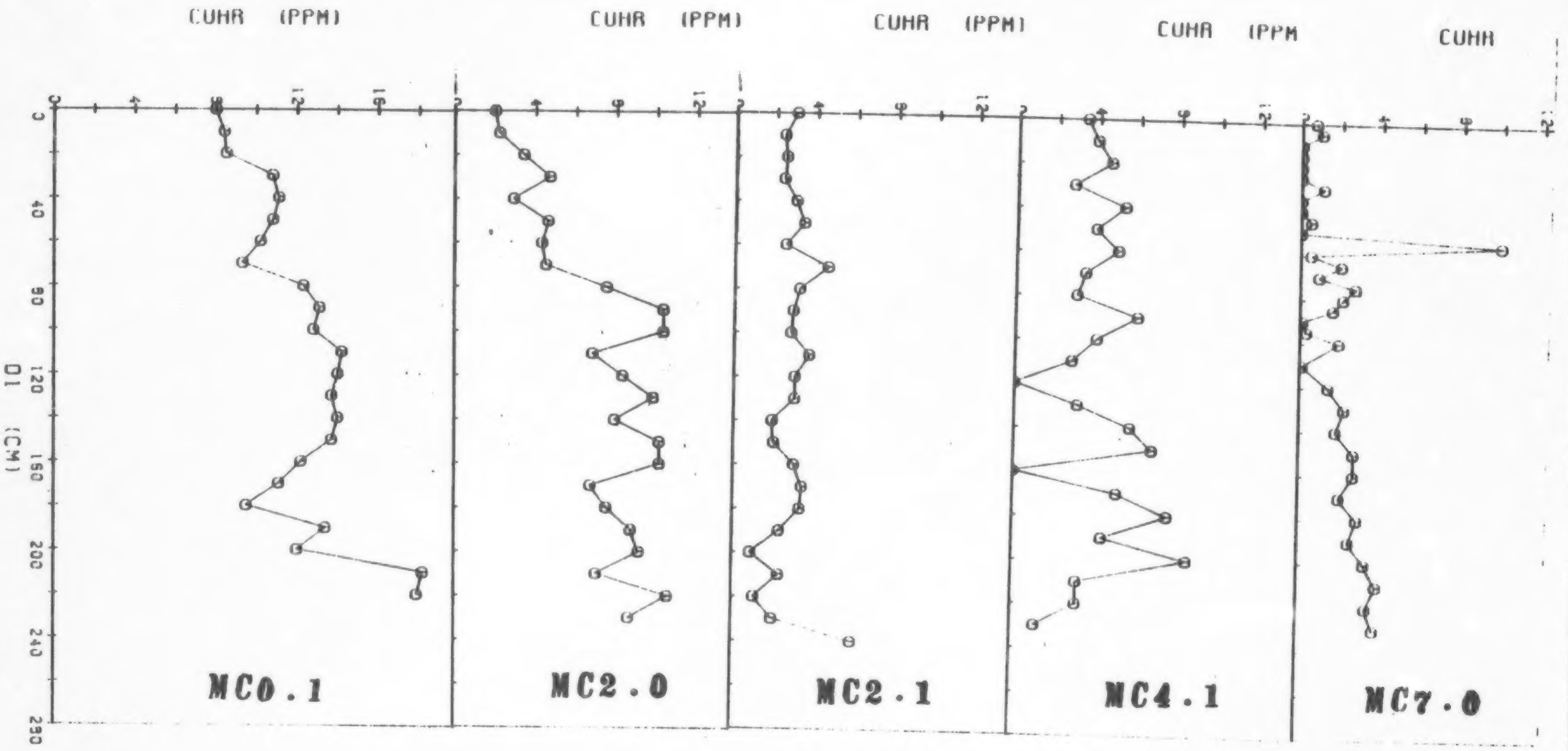

Fig. 10-21C Reducible fraction of Copper in 5 cores from McBeth Fjord

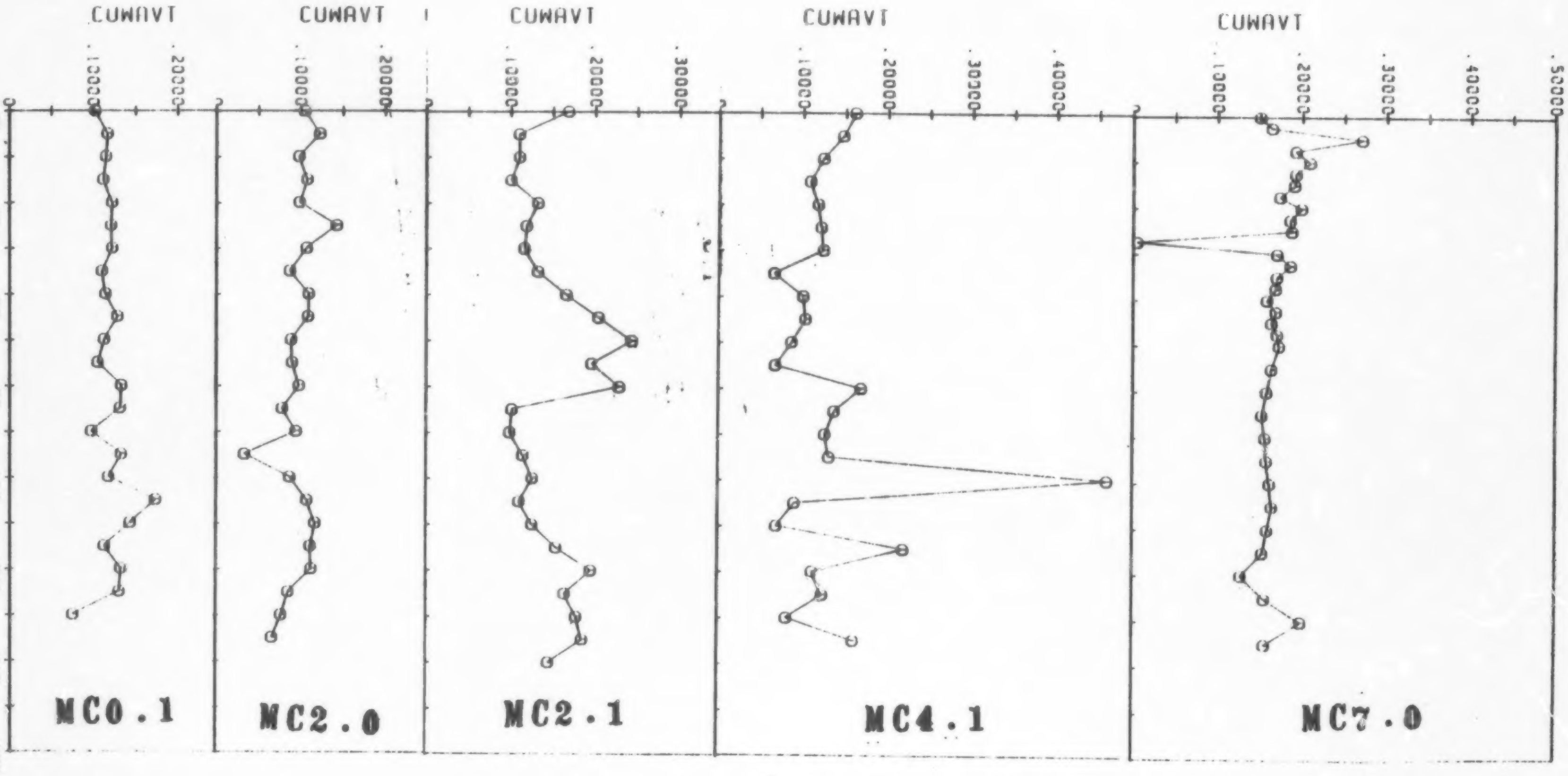

Fig. 10-22C Ratio of weak acid leachable Copper/total Copper in 5 cores from McBeth Fjord

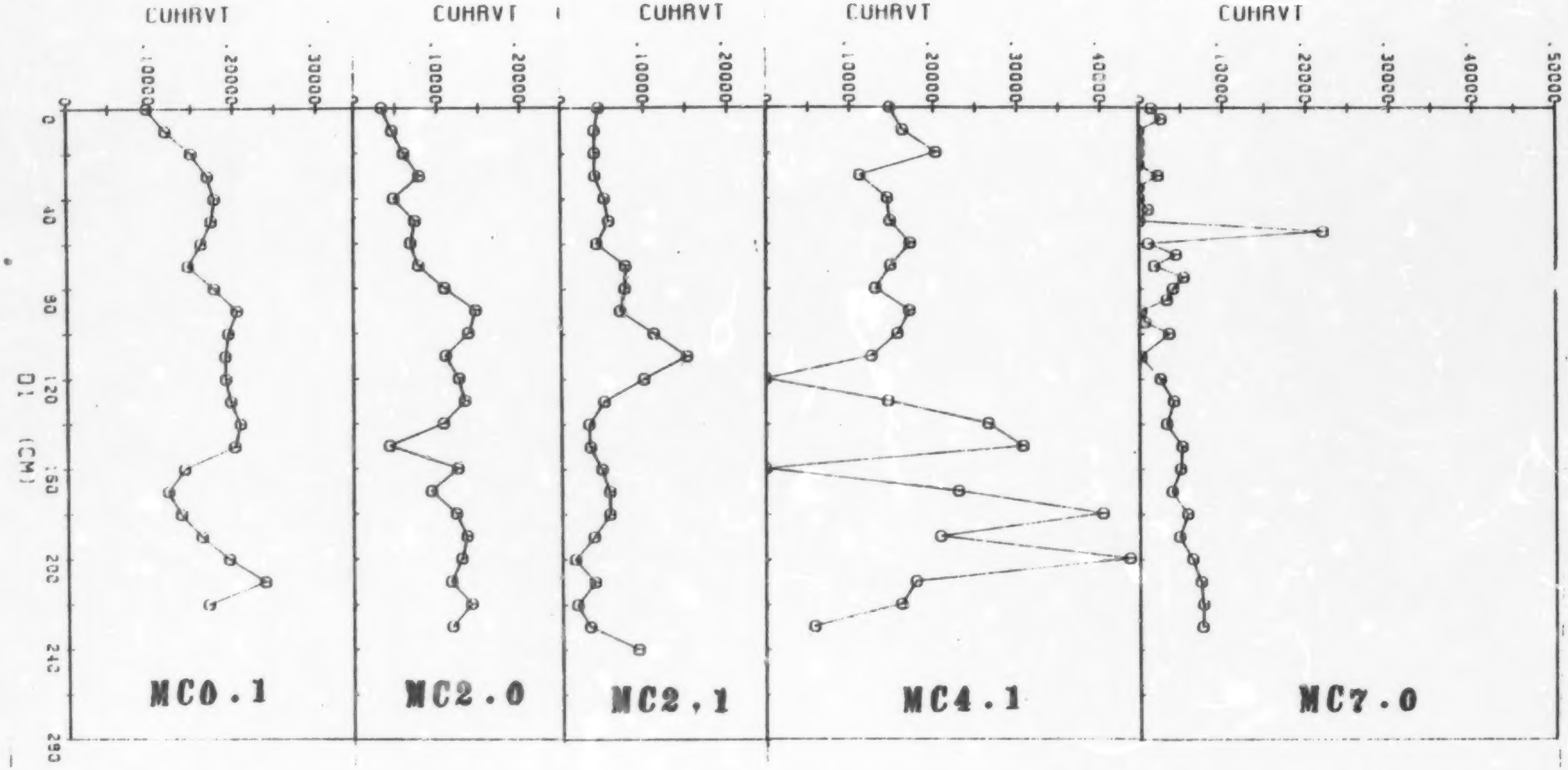

Fig. 10-23C Ratio of Reducible Copper/total Copper in 5 cores from McBeth Fjord

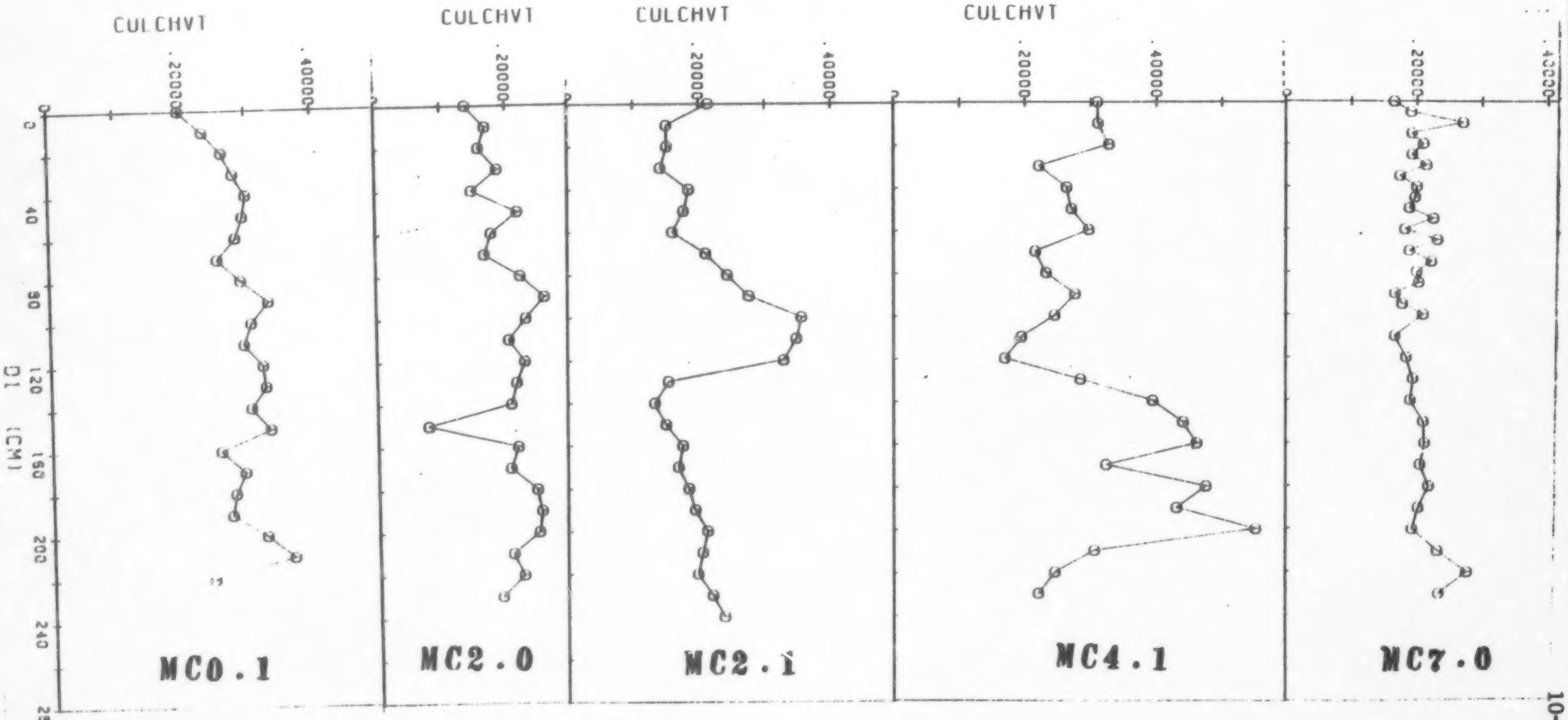

Fig. 10-24C Ratio of labile Copper/total Copper in 5 cores from McBeath Fjord

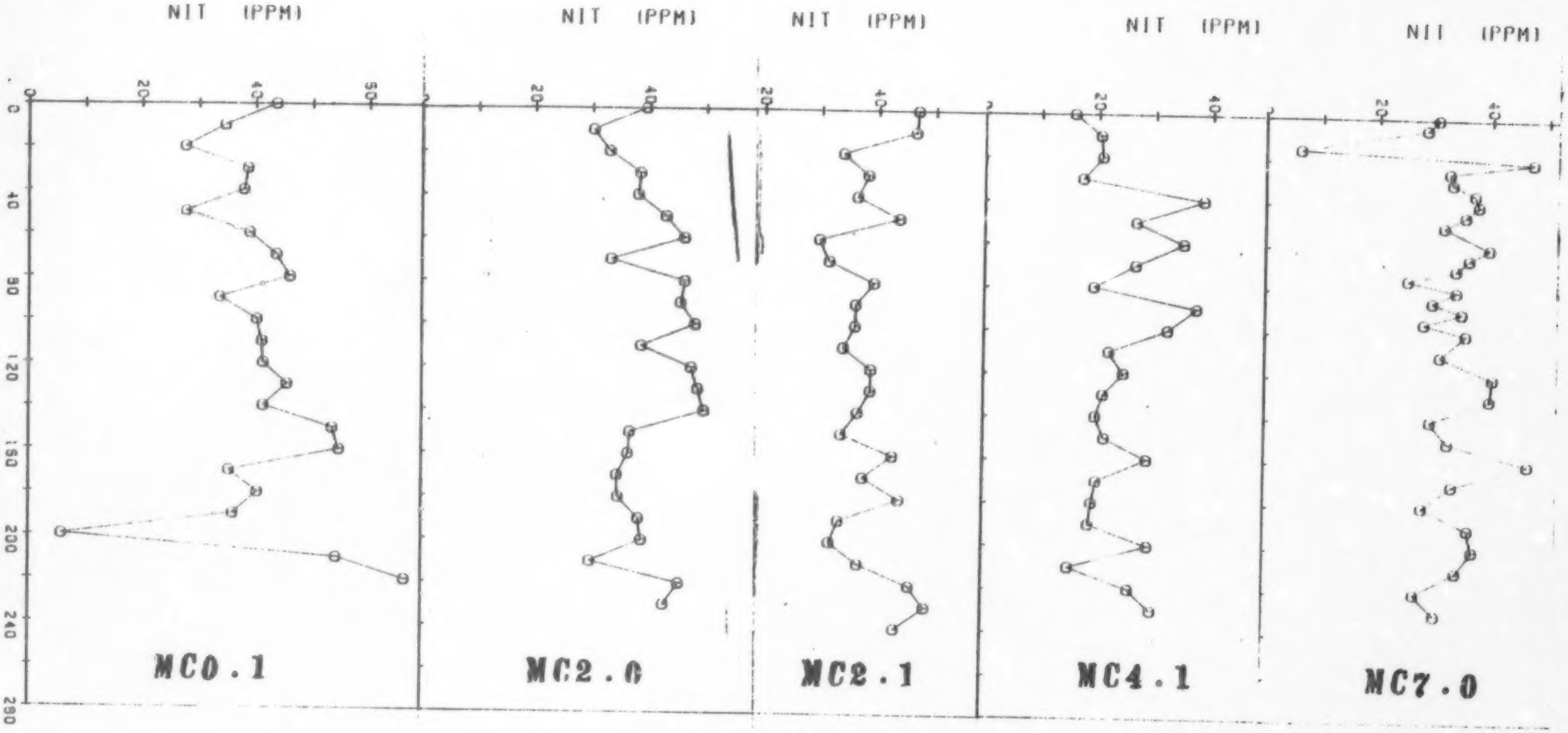

Fig. 10-25C Total Nickel in 5 cores from McBeth Fjord

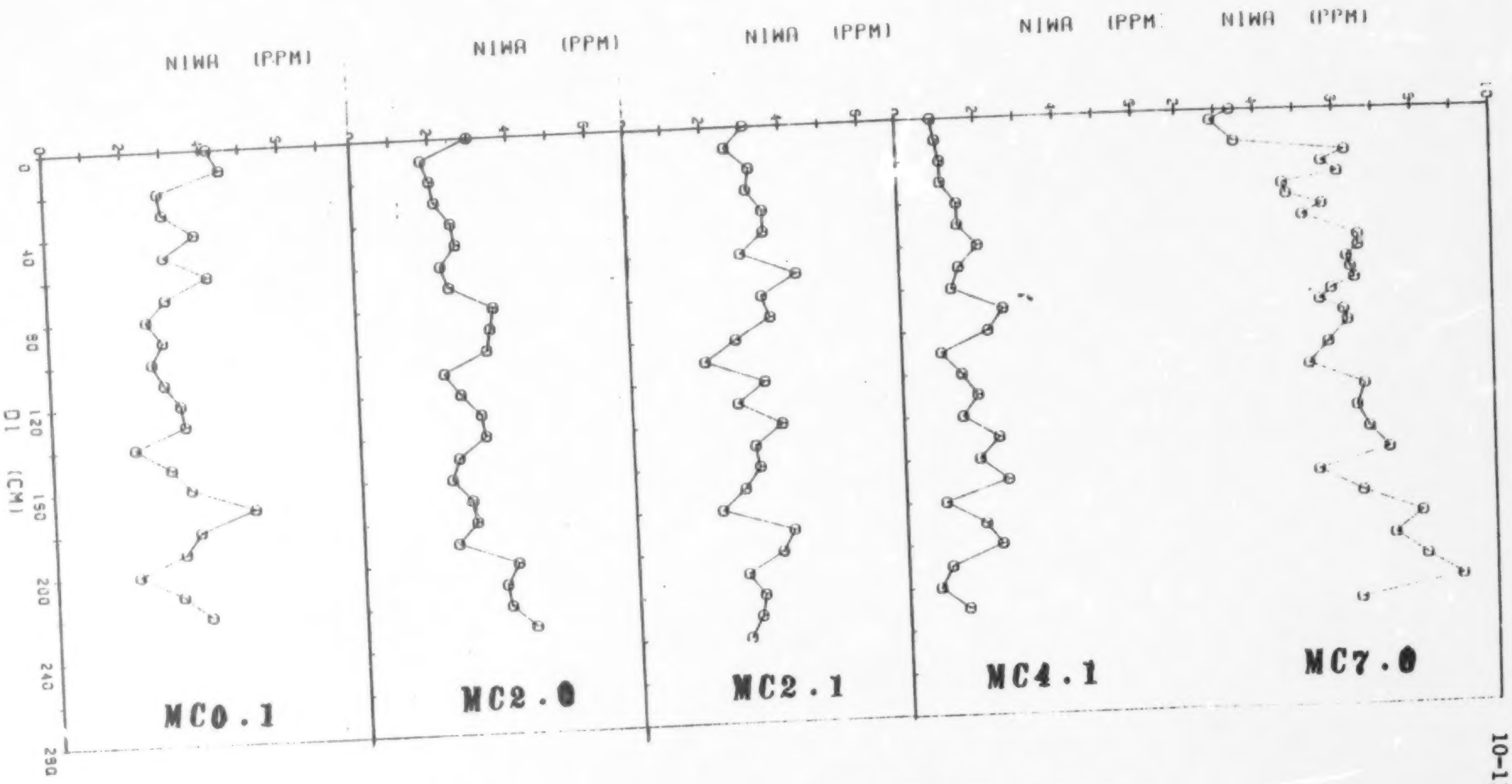

Fig. 10-26C Weak acid leachable Nickel in 5 cores from McBeth Fjord

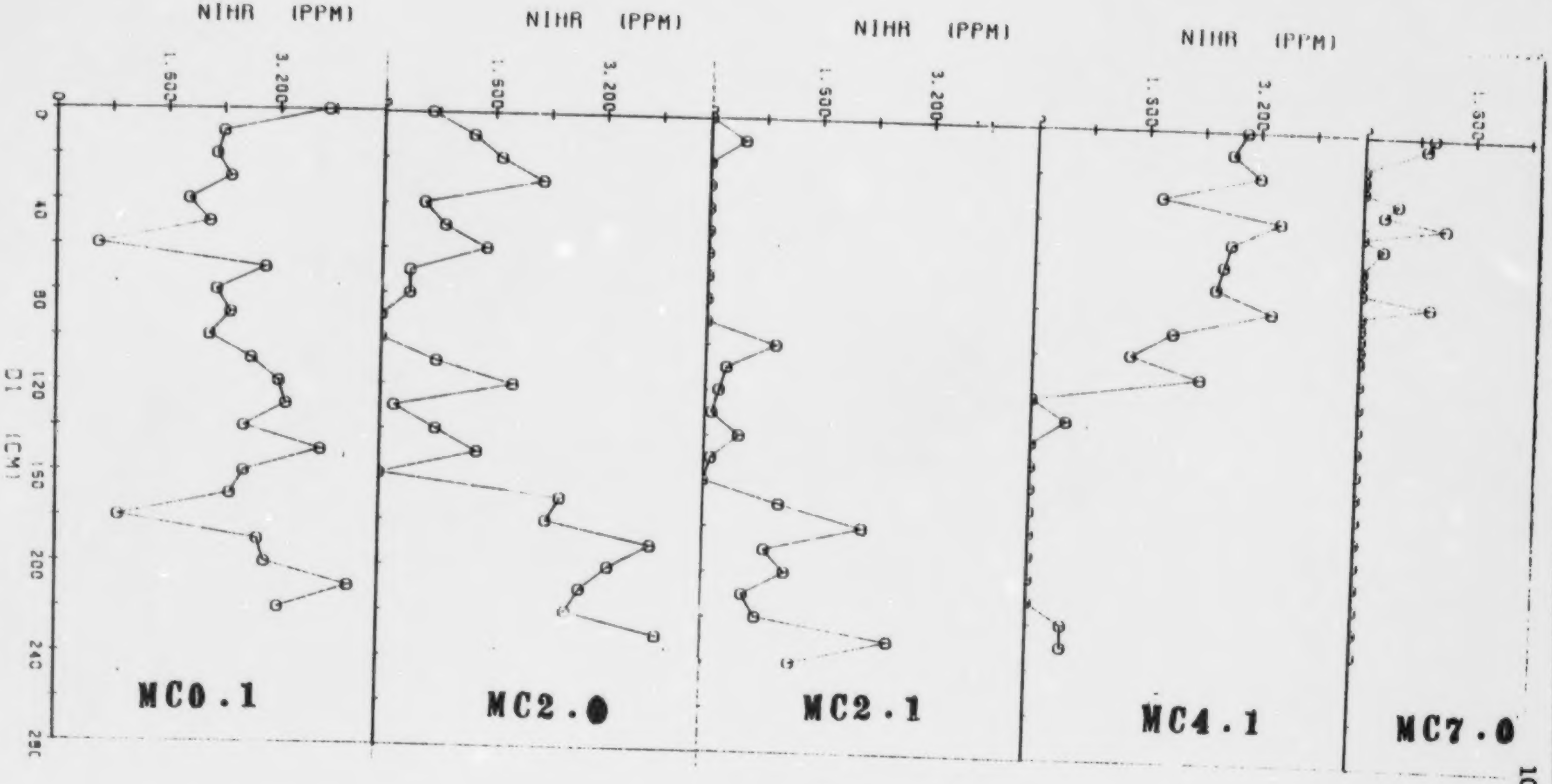

Fig. 10-27C Reducible fraction of Nickel in 5 cores from McBeth Fjord

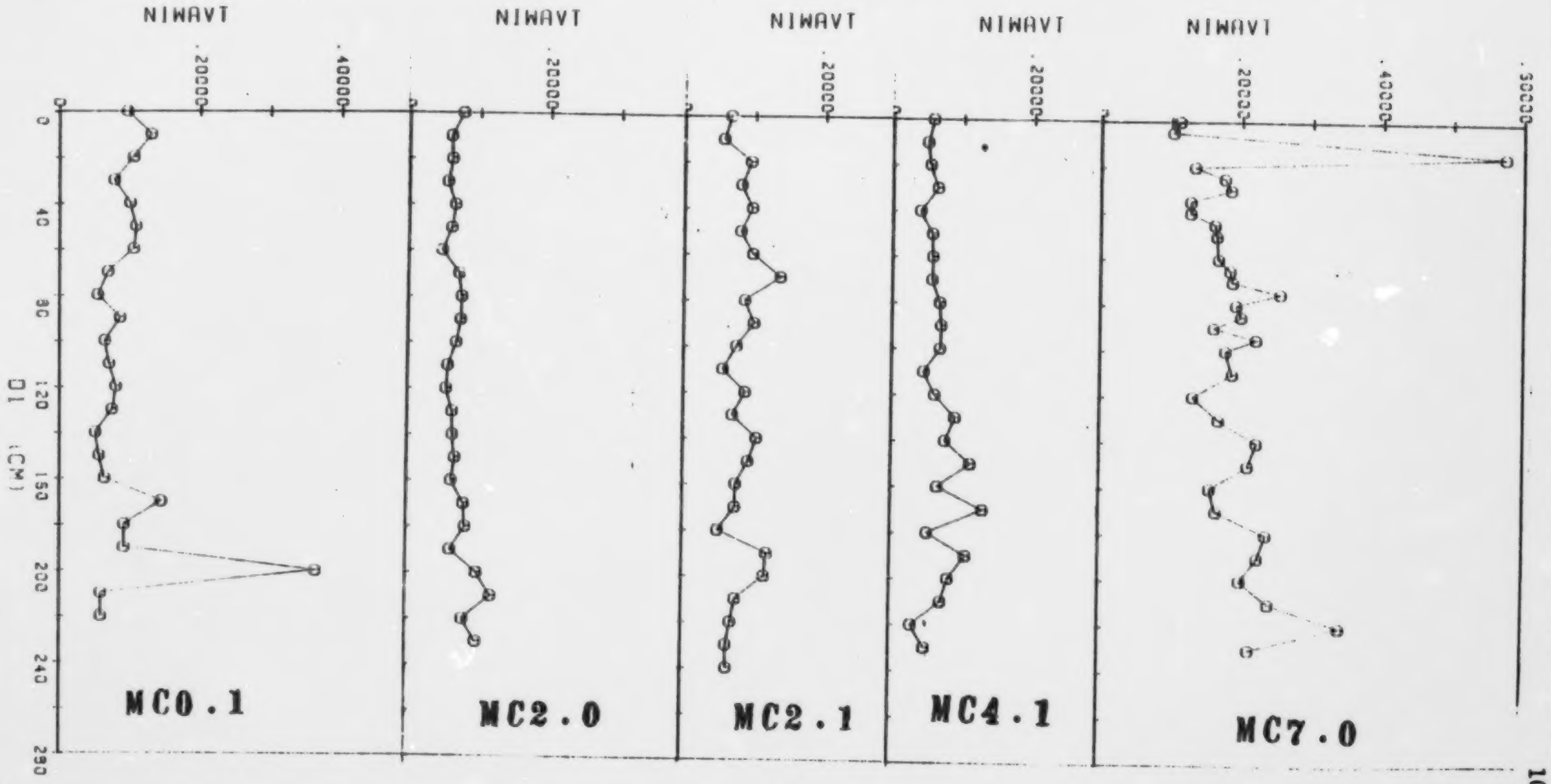

Fig. 10-28C Ratio of weak acid leachable Nickel/total Nickel in 5 cores from McBeth Fjord

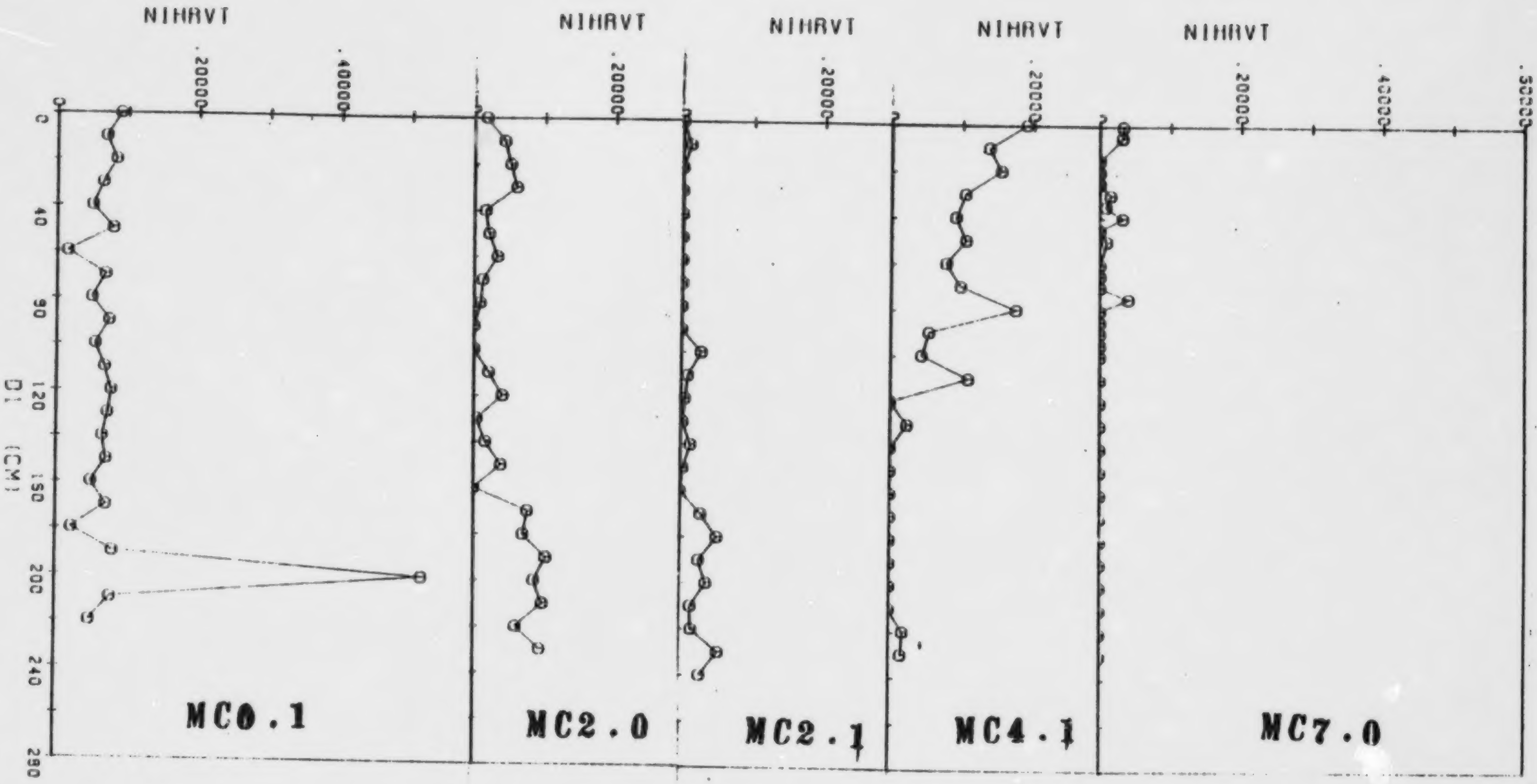

Fig. 10-29C Ratio of reducible Nickel/total Nickel in 5 cores from McBeth Fjord

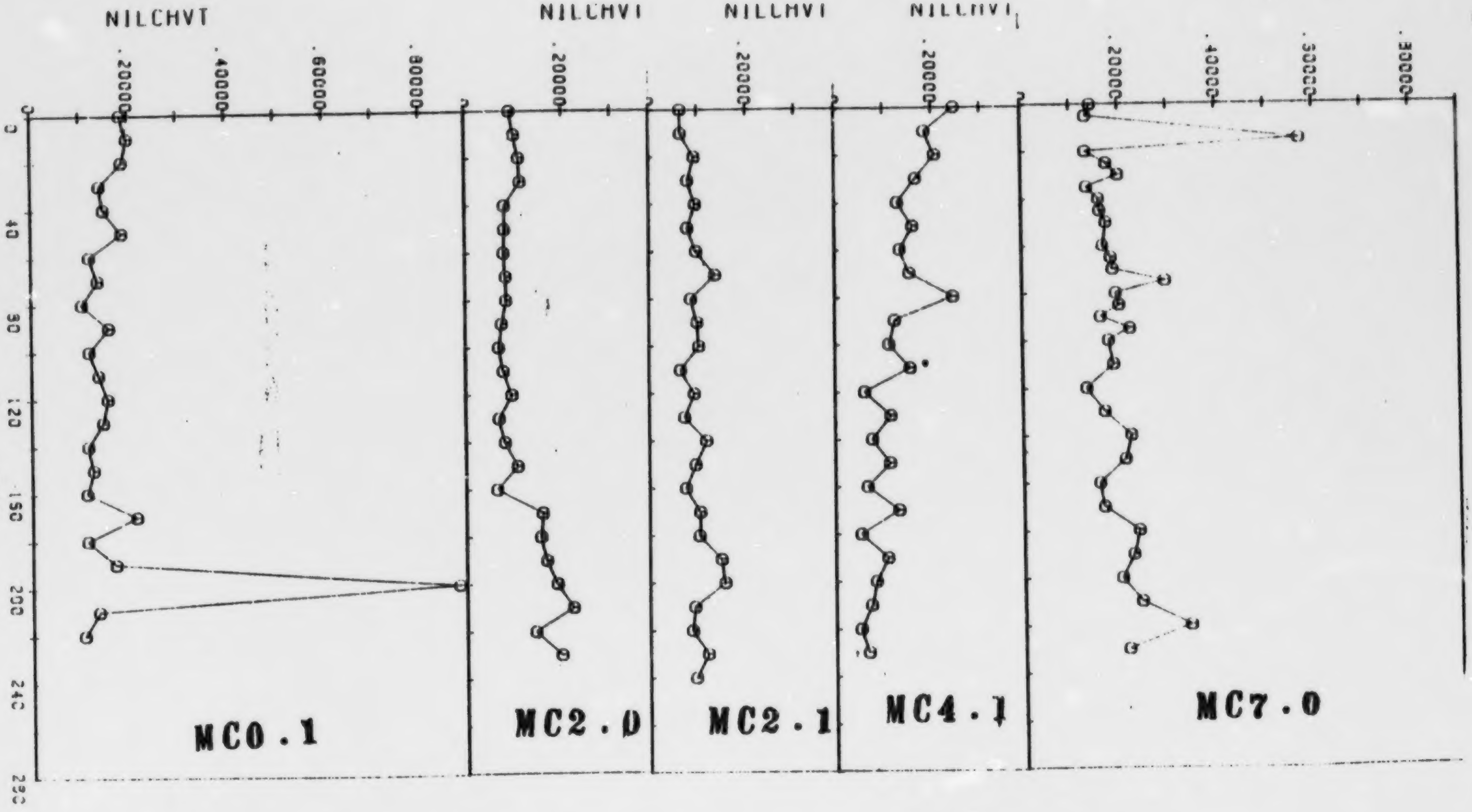

Fig. 10-30C Ratio of labile Nickel/total Nickel in 5 cores from McBeth Fjord

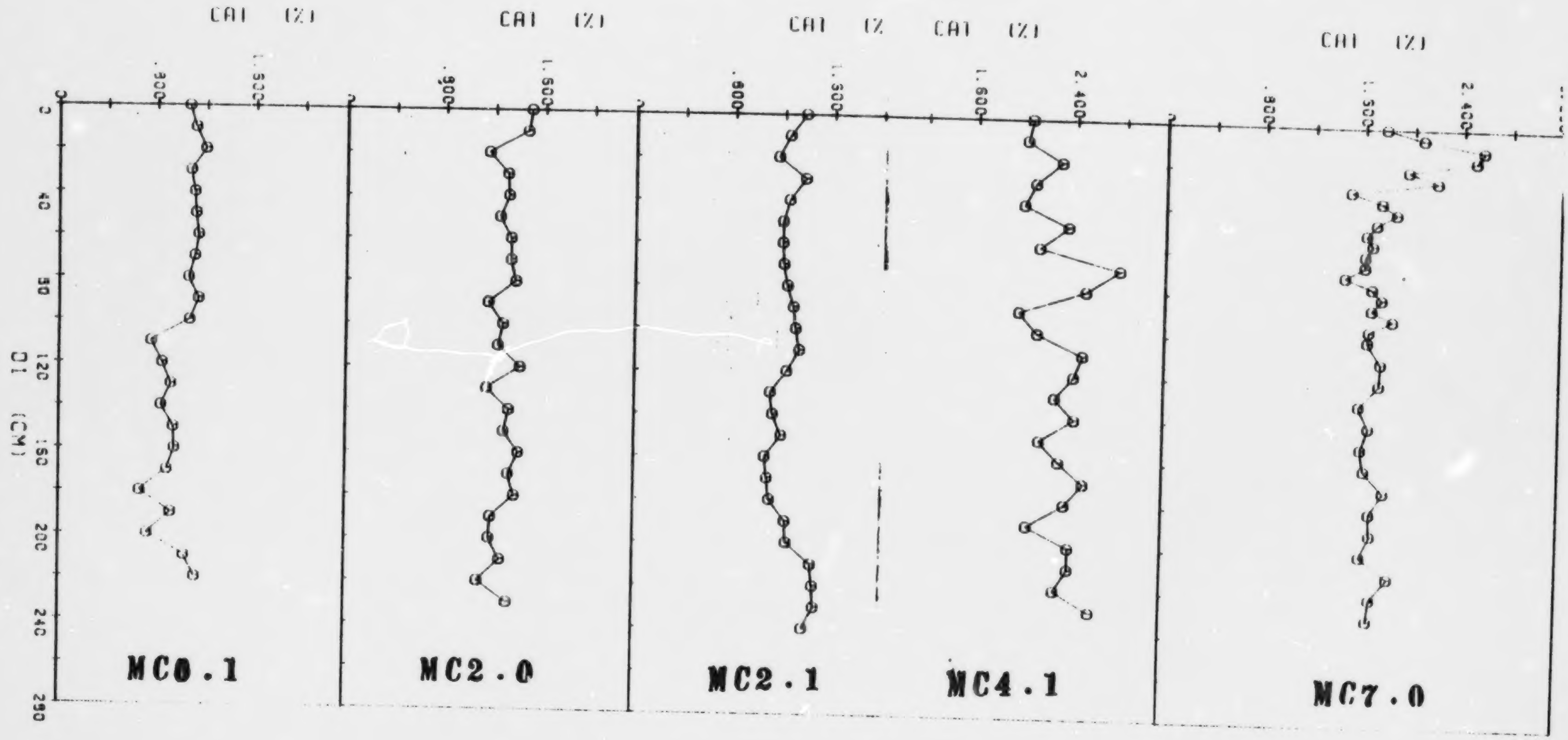

Fig. 10-31C Total Calcium in 5 cores from McBeth Fjord

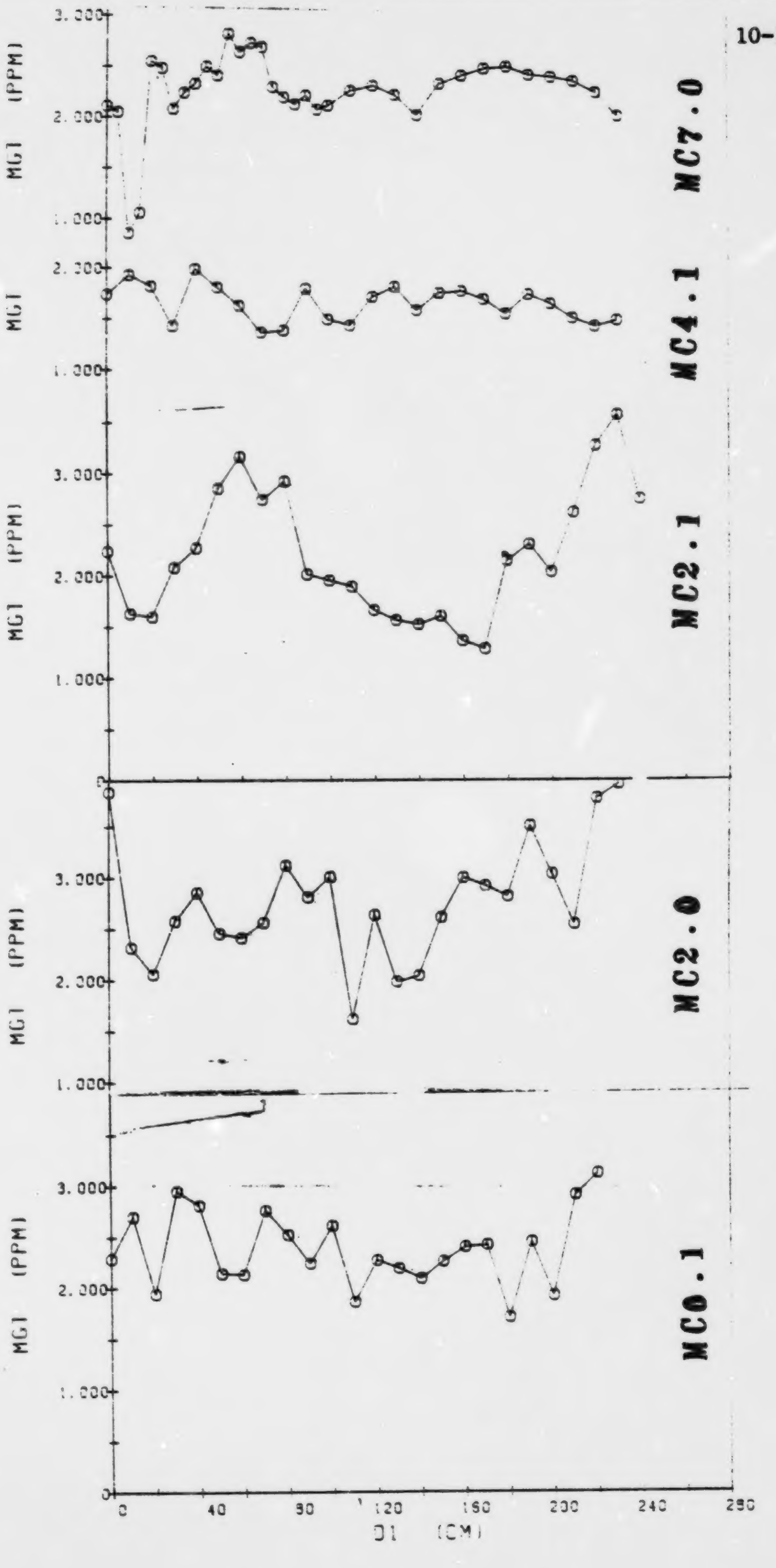

Fig. 10-32C Total Magnesium in 5 cores from McBeth Fjord

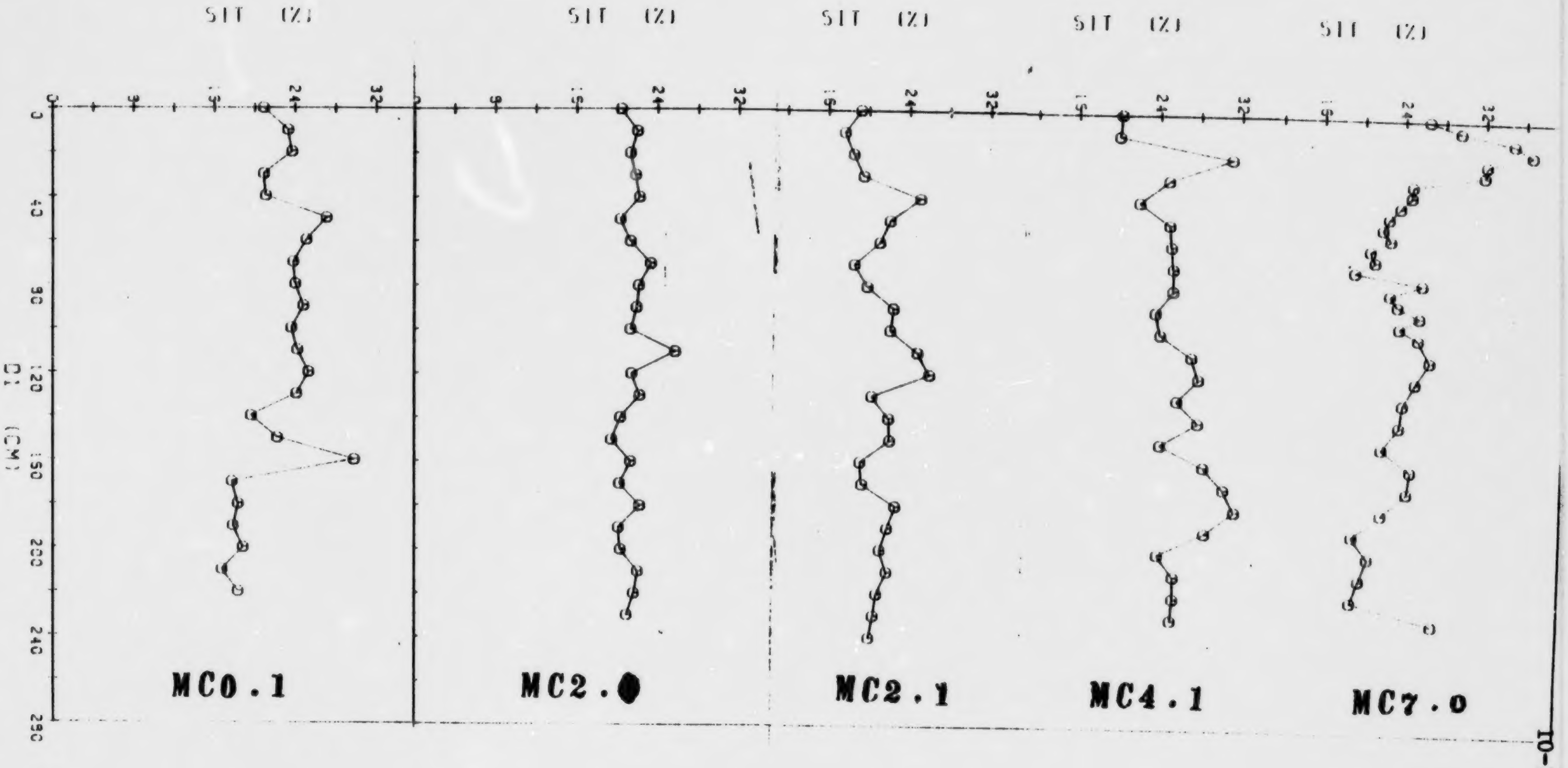

Fig. 10-33C Total Silicon in 5 cores from McBeth Fjord

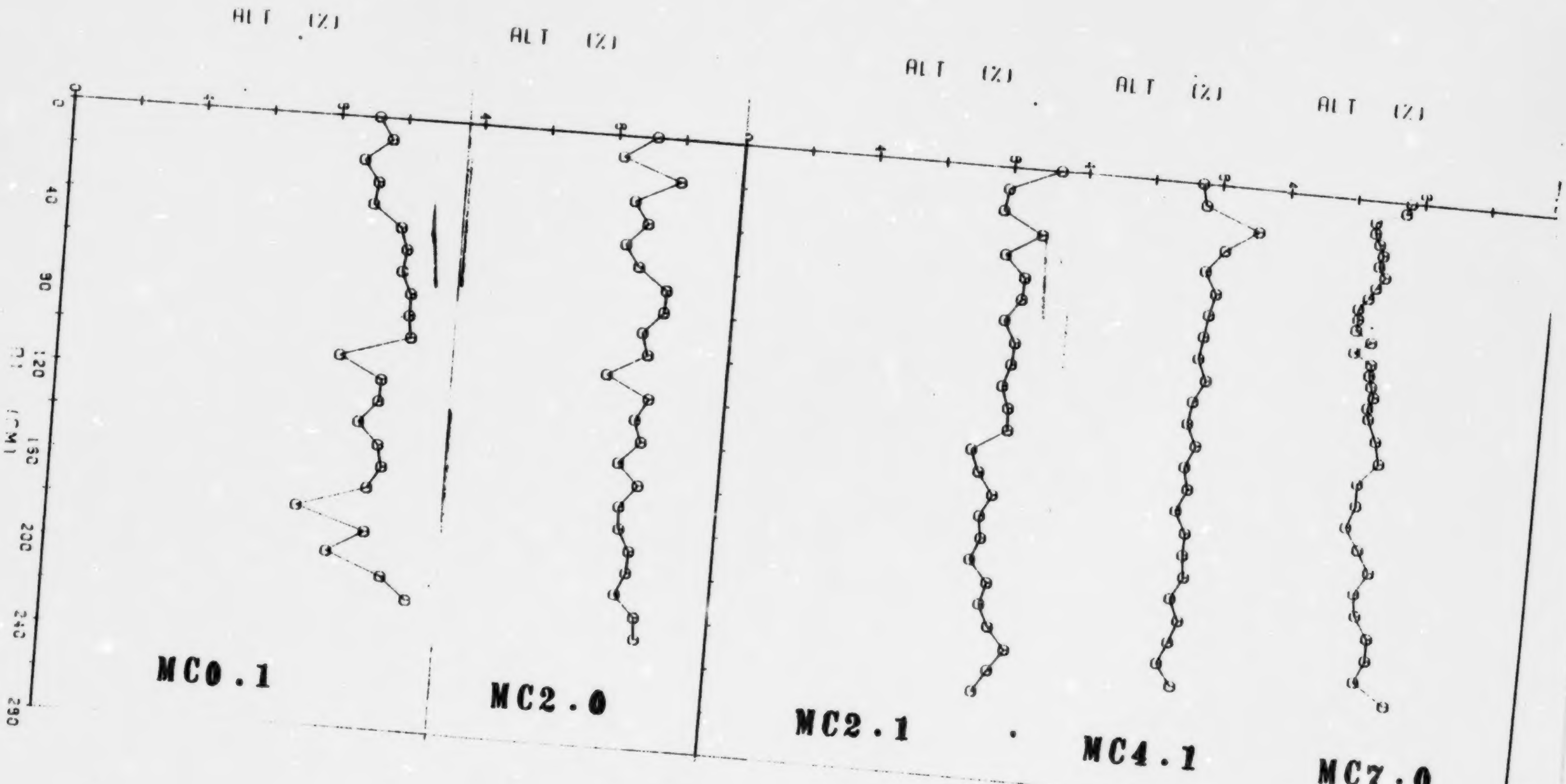

Fig. 10-34C Total Aluminum in 5 cores from McBeth Fjord

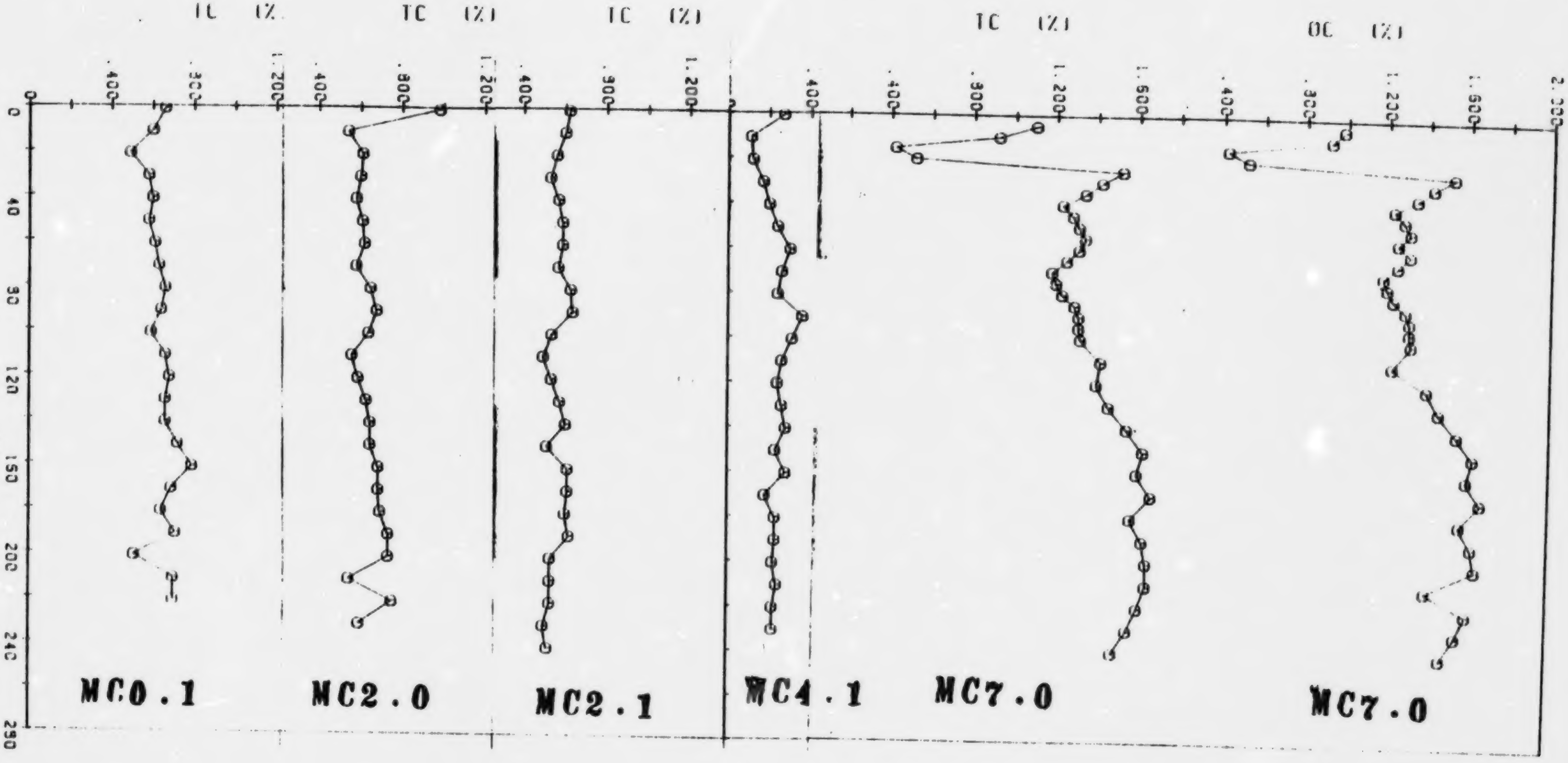

Fig. 10-35C Total Carbon in 5 cores from McBeth Fjord

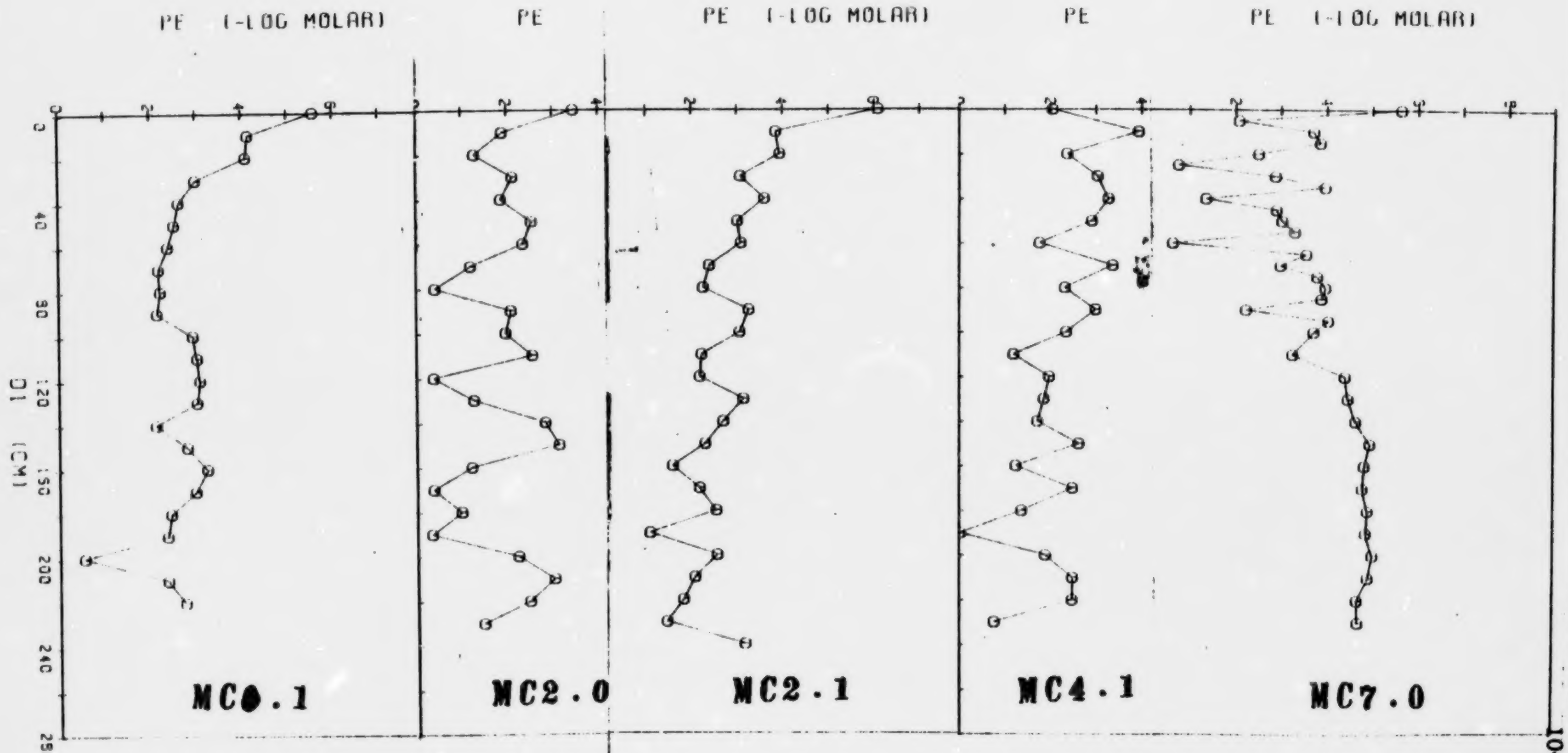

Fig. 10-36C Redox potential in 5 cores from McBeth Fjord

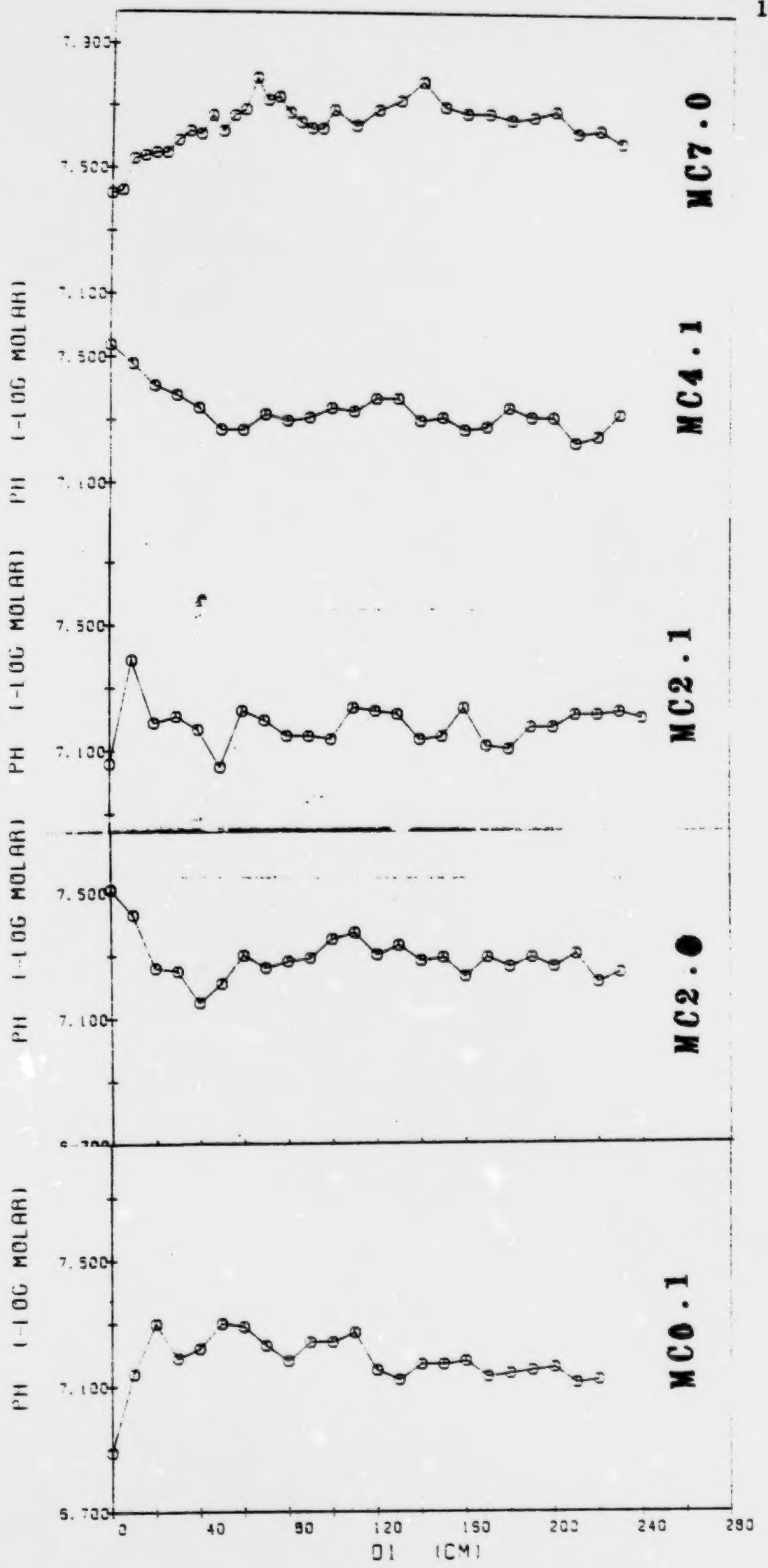

Fig. 10-37C pH in 5 cores from McBeth Fiord

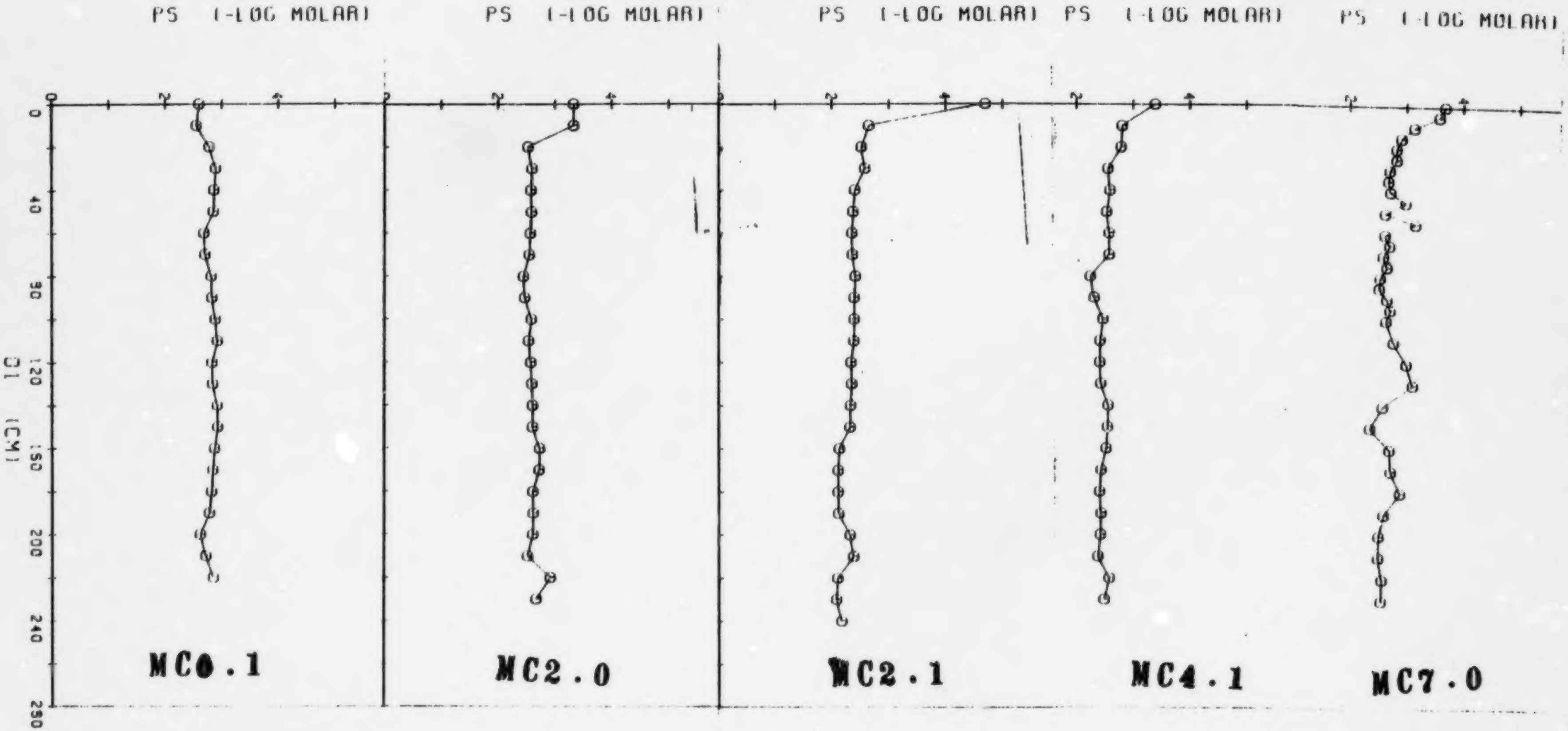

Fig. 10-38C PS in 5 cores from McBeth Fjord

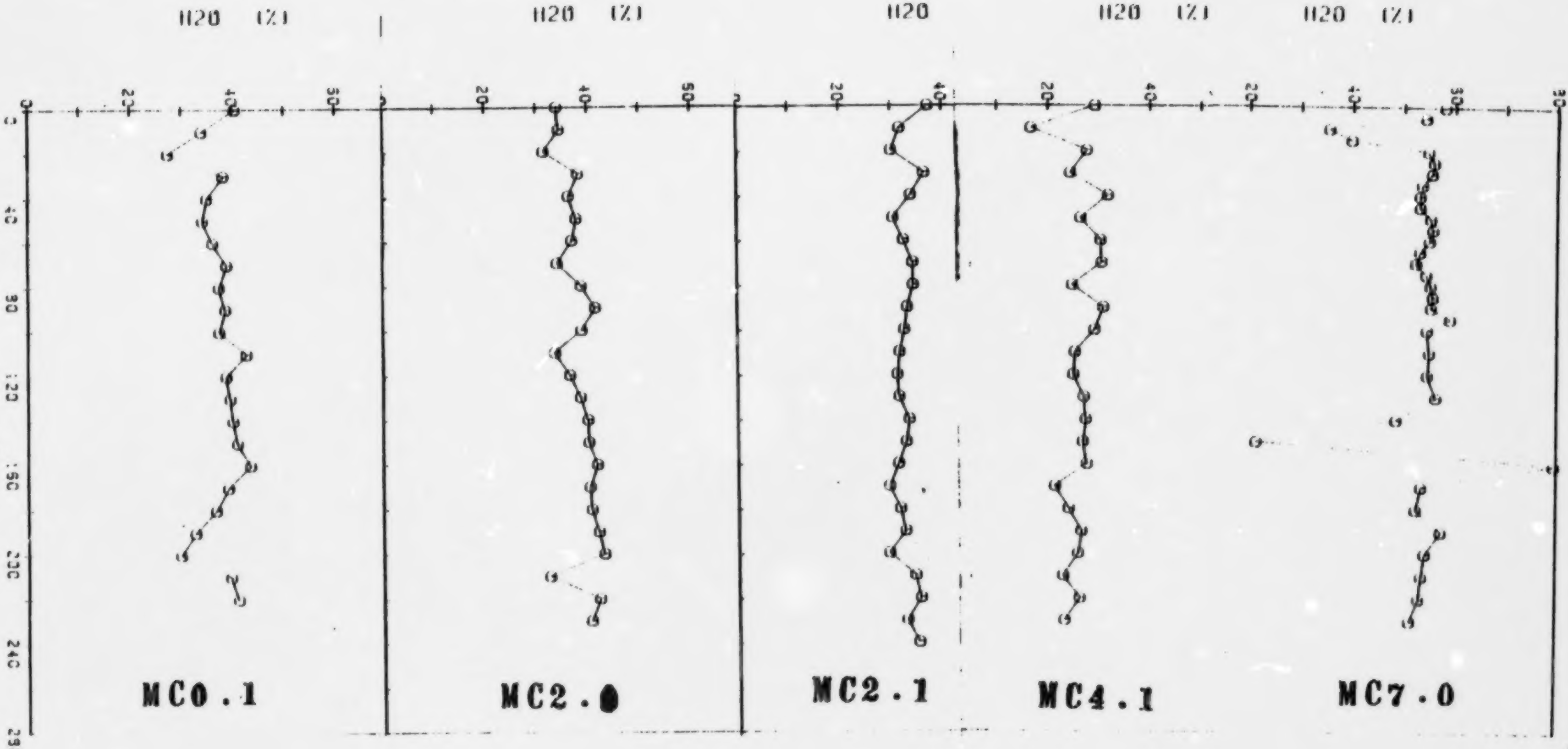

Fig. 10-39C Moisture content in 5 cores from McBeth Fiord

SEDIMENTOLOGY AND GEOTECHNICAL PROPERTIES OF SURFICIAL BOTTOM SEDIMENTS, BAFFIN ISLAND FJORDS

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1. INTRODUCTION

The objectives of this report are to present the sedimentological and geotechnical data recovered from analyses conducted on 19 Lehigh gravity cores collected from Cambridge, Itirbilung and McBeth fjords onboard *CSS Hudson* cruise 83-028. This report also presents some preliminary observations of trends in the data and their relationship to geographic position in the fjord systems.

Studies concerning the sedimentology of high latitude fjords are few and have largely been conducted during the last decade. The recent interest in sedimentological studies of high latitude fjords stems from the realization that they provide ideal settings for process modelling. The advantage of the fjord setting is that they are enclosed mini-ocean basins in which process rates are rapid and associated environmental gradients are high (Skei, 1983).

The aim of this project is to develop a facies model for slope and base of slope deposits in glaciomarine settings based on both sedimentological and geotechnical properties of Baffin Island fjord sediments.

2. RESEARCH PROCEDURES

A. Shipboard Methods.

Approximately 8 cm diameter core samples of surficial bottom sediments were recovered using a modified Lehigh gravity coring system (Richards and Keller, 1961). The coring device was slowly lowered to several metres above bottom and was then allowed to "free fall" into the bottom sediments in order to obtain maximum penetration. The position of the coring device in the water column was monitored by sonar.

Downwarping of beds along the core edge was rarely observed and, in general, sample disturbance (due to water washing) was restricted to the uppermost 10 cm of core. The presence of open worm burrows at various depths in many of the recovered cores attests to the minimal degree of sample disturbance.

A total of 19 Lehigh gravity cores were recovered from Itirbilung, Cambridge and McBeth fjords during the 1983 *CSS Hudson* cruise 83-028 (7 from Cambridge, 8 from Itirbilung and 4 from McBeth). The average recovered core length was 187 cm and the cores ranged from 20.5 to 268 cm in length. An additional core from each of the above fjords was recovered during *CSS Hudson* cruise 82-031 during the fall of 1982 (Hein and Longstaffe, 1983). The cores were split and analyzed onboard immediately after recovery. An archive half (split) or whole core from each core station was securely stored in the ship's cooler for subsequent X-radiography conducted at the Bedford Institute of Oceanography.

Immediately after splitting, the cores were logged in detail, tested for undisturbed and remoulded shear strength, and subsampled for subsequent laboratory work which includes water content, wet bulk density, Atterberg Limits, clay mineralogy, and grain size analyses. In addition, the cores were photographed in detail as they were logged.

The cored sediments were described in terms of features discernable in split core which include; colour, approximate grain size, sedimentary structure, bedding and the nature of contacts. A Munsell colour chart was used in order to accurately determine the variation in sediment colour.

Subsampling procedures for sedimentological, geotechnical and mineralogical analyses were preformed immediately after core logging; subsample locations were chosen on the basis of down-core change in sediment type or at regular intervals when down-core variations in sediment type were not observed.

A syringe-style mini-coring device was used for water content and wet bulk density determinations. The mini-corer removed a constant trimmed volume (15.397 cm^3) of sediment from the cores. Following removal, the sediment plugs were extruded into pre-weighed, wide-mouth glass jars. The jars were sealed with parafilm, capped, taped and packed for shipping. Bulk subsamples for subsequent Atterberg Limit, clay mineralogy and grain size analyses were removed and bagged after miniature vane shear tests were conducted.

Miniature vane shear tests were conducted at the various subsample locations using a Wykeham-Farrance miniature vane shear apparatus. The uppermost subsample locations were not tested due to sample disturbance. The tests were conducted with the top of the vane blades flush with the split surface at or near the center of the cores. Remoulded tests were done at the undisturbed test locations after the sediment had been homogenized with a spatula.

Specifications for the vane shear tests are as follows: Gear speed = 1/4 rpm, vane size = 1/2 x 1/2 in, Spring size = 1, Calibration = 30 degrees = 0.25 kg-cm. Values for sediment shear stress at failure (strength) were calculated by the following relationships:

$T = (L)(0.0083)$ (from calibration curve)

$S = T/(\pi \times D^2 (H/2 + D/6))$ (Dunn et al., 1980)

where T = torque, D = vane diameter, H = vane height, S = shear strength, L = load twist angle = maximum degrees of rotation measured on the inner dial of the vane shear apparatus.

B. Laboratory Methods

The water content (w) of a sediment is defined as the ratio, given as a per cent, of the weight of water to the weight of sediment grains based on the oven dried weight of the sediment (Holtz and Kovack, 1981). Water contents were measured using the ASTM D2216-71 procedure (Bowles, 1970, ASTM, 1981). All water content values have been corrected for salt content. Wet bulk densities were determined by dividing the wet weight of the subsampled soil plugs by the volume of the sediment.

Atterberg Limits are water contents at which the sediment consistancy changes from semi-solid to plastic to liquid states. The liquid limit (wL) and the plastic limit (wP) are water contents which represent, respectively, the upper and lower boundaries of plastic behavior (Holtz and Kovack, 1981). The plasticity index (PI) is the range of water contents over which the sediment shows plastic flow (PI=wL-wP). The liquid limits were measured using the ASTM D23-66 procedure (Bowles, 1970, ASTM, 1981). The plastic limits were measured using the ASTM D424-59 procedure (Bowles, 1970, ASTM, 1981). The subsamples were not sieved or dried before determination of the Atterberg Limits. All water contents determined for the Atterberg Limit values have been corrected for salt content.

Grain size frequency distributions of 27 subsamples were determined for the <75 micron size fraction using the hydrometer method (Bowles, 1970). Salts were removed from the subsamples prior to the determinations by washing with distilled water. The samples were not dried before analysis. The >75 micron size fractions were removed by wet sieving prior to hydrometer analysis. In cases where the coarse fraction accounted for more than 20% of the material, the coarse fractions were dry sieved in order to obtain complete grain size distributions.

Grain size frequency distributions of 113 subsamples were determined with the Atlantic Geoscience Centre computerized settilng tube - sedigraph system. Gravel fractions were separated by wet sieving with a standard 2 mm sieve. Sand fractions (63 microns to 2 mm) were analysed for equivilant spherical settling diameter using the settling tube method. Particles passing a standard 63 micron wet sieve were analysed using the sedigraph 5000D over the range of 0.5 to 63 microns. The subsamples were not dried prior to analysis. Sodium hexametaphosphate was used as a dispersing agent in all grain size analyses. Values for mean grain size and standard deviation were determined by the moments method. Skewness and kurtosis values were determined graphically (Folk and Ward, 1957).

3. RESULTS

A. Facies Definitions

The cored sediments are tentatively classified into 7 major facies:

1. Massive muds / silty muds.
2. Burrowed muds / silty muds.
3. Pebbly muds / silty muds.
4. Massive sands / silts.
5. Graded sands / silts.
6. Whispy-discontinuous sands / silts.
7. Laminated sands / silts and muds.

The majority of the sediment consists of burrowed and massive muds / silty muds (facies 1 and 2) alternating with relatively thin (<10 cm thick), discrete sand or silt units (facies 4, 5 and 7). Facies designations are shown on core sketches (fig. 11-1 to 11-7) and are listed according to geotechnical subsample number in tables 11-1 to 11-3. The facies designations are based on features discernable in fresh, split core and in core X-radiographs (see appendicies 1 and 2).

FACIES 1: Massive muds / silty muds.

The massive muds / silty muds account for approximately 53% of the cored sediments. Average bed thickness of this facies is 17.8 cm (range: 1 to 70 cm). Sediments of this facies are usually olive gray to dark gray, structureless, homogeneous muds or silty muds which show slight to moderate burrowing. Burrows either filled with dark, reduced sediment or open burrows (1-3 mm diameter) are widely scattered throughout the sediments. The burrows usually show no preference for vertical or horizontal orientation. Facies 1 sediments account for the majority of sediments in core IT-3.1 (fig. 11-6)

FACIES 2: Burrowed muds / silty muds.

Approximately 30% of the cored sediments are represented by burrowed muds / silty muds. Average bed thickness of facies 2 is 42.2 cm (range: 4 to 187 cm). The burrowed sediments are usually mottled black dark gray to olive gray in colour and are typically homogeneous and show only biogenic structure. Open burrows (1-3 mm diameter) and dark, reduced filled burrows are present in moderate to heavy concentrations (> 20% of split core surface). Both the open burrows and the reduced, filled burrows usually show no preference with respect to orientation. The reduced filled burrows less commonly show horizontal alignment over some intervals. Cores MC-2.0 and MC-0.1 are largely comprised of facies 2 sediments (fig. 11-6).

FACIES 3: Pebbly muds / silty muds.

Pebbly muds / silty muds represent approximately 2.6% of the cored sediments. Average bed thickness of this facies is 5.4 cm (range: 2 to 11 cm). The pebbly muds / silty muds are commonly dark gray to olive gray in colour. Sediments of this facies occur as intervals in which outsized clasts are concentrated in a fine-grained matrix. The large clasts generally show sub-angular to angular textures. A-axis measurements of the outsized clasts range from <2 cm to 10 cm. The clasts show felsic to mafic compositions of both high-grade metamorphic and igneous origin. Pebbly muds / silty muds often show an association with horizons of higher silt and sand content. Cores CA-1.2, IT-2.2 and MC-2.1 show examples of facies 3 sediments (fig. 11-2, 11-5, 11-7).

FACIES 4: Massive sands / silts.

Massive sands / silts account for approximately 2.4% of the measured cores. Average bed thickness of facies 4 is 3.4 cm (range: 2 to 5 cm). Sediments of this facies are typically massive, fine to medium-grained sands or silts and occur as discrete olive gray to dark gray beds. Upper and basal contacts are commonly sharp and irregular. A few of the massive sand / silt units appear lenticular in that they thin or "pinch out" across the core width. In some cases the massive sand / silt units show an association with angular to subangular, outsized clasts. Facies 4 sediments are common in cores CA-4.2, IT-1.2 and MC-4.1 (fig. 11-3, 11-5, 11-7).

FACIES 5: Graded sands / silts.

Approximately 2.6% of the cored sediments are represented by graded sand / silt units. Average bed thickness of facies 5 is 3.7 cm (range: 2 to 8 cm). The graded sand / silt units occur as discrete olive gray to dark gray beds. Grain sizes within facies 5 beds range from coarse sand to silt. Facies 5 units are usually well graded (normal grading) or show clearly gradational upper contacts. Basal contacts are typically sharp-horizontal and sharp with concave-up portions (scoured). Sharp-irregular basal contacts are less common. In some cases millimeter scale planar laminae and cross-laminae are present within central and upper portions of facies 5 beds (Bouma Ab sequences). Cores IT-0.1, IT-0.3 and IT-0.4 show good examples of facies 5 sediments (fig. 11-3, 11-4).

FACIES 6: Whispy-discontinuous sands / silts.

Average bed thickness of the whispy-discontinuous sands / silts is 0.76 cm (range: 0.5 to 2 cm). The whispy-discontinuous sands / silts commonly occur as isolated, olive gray to dark gray lenses of fine to medium-grained sand or silt. Basal contacts are often sharp and concave-up whereas upper contacts are typically gradational. In many cases, facies 6 sands / silts contain subangular to angular, outsized clasts. Although whispy-discontinuous sand / silt units are distinctive in split core and in X-radiographs, they are invariably less than 2 cm thick and are therefore catagorized as facies 7, laminated sands / silts and muds (see facies 7 below). Facies 6 sediments are present in cores CA-6.0, IT-0.3 and IT-0.4 (fig. 11-3, 11-4).

FACIES 7: Laminated silts / sands and muds.

Approximately 9.6% of the cored sediments are categorized as laminated sand / silt.

Average bed thickness of facies 7 is 5.6 cm (range: 0.5 - 26 cm). In cases where units of facies 4, 5 and 6 (massive sands / silts, graded sands / silts and whispy sands / silts) are less than 2 cm in thickness, the above facies definitions are considered inappropriate for correlation with the geotechnical properties. The bulk density and water content subsampling device has a diameter of 2.6 cm. Consequently, subsampled units of less than approximately 2 cm in thickness are considered to be thinner than the lower resolution of the geotechnical equipment. In such cases, intervals over which these thin units are interbedded with facies 1, 2 and 3 are categorized as laminated sands / silts and muds. The laminated sand / silt units are commonly whispy-discontinuous sands / silts (facies 6) and graded sands / silts (facies 5) and less commonly massive sands / silts (facies 4) interbedded with muds / silty muds.

B. Geotechnical Properties

Results from analyses for the geotechnical properties are presented in Table 11-1, 11-2 and 11-3. Cases where the subsamples were not testable due to very low plasticity or shear strength are designated as N.P.. Average values for the geotechnical properties appear in Table 11-4 along with Atlantic mean values. Also presented in Table 11-4 are average values for the muddy facies alone (facies 1, 2 and 3).

Values for sediment shear strength range from nil to 8.77 kPa. Sediment shear strength values typically increase down-core in all fjords sampled regardless of location within a given fjord. Although miniature vane shear tests conducted on sandy sediments are considered invalid, they can be used as indices of relative shear strength (Sego, pers. comm., 1984).

Water contents measured in the three fjords range from 26% to 137% (mean: 59%). Values for wet bulk density range from 11.87 kN/m^3 to 19.42 kN/m^3 (mean: 16.48 kN/m^3). In general, wet bulk densities and water contents typically show a strong down-core relationship with wet bulk density increasing and water content decreasing with greater core depth.

Liquid limits range from 23.4% to 86.1% (mean: 43.1%) and plastic limits range from 12.6% to 46.6% (mean: 27.7%). Plasticity indices range from 1.9 to 40.9 (mean: 15.0). Down-core variations in the Atterberg Limits and plasticity indices are typically complex and show no clear down-core trends.

C. Textural Properties

Size frequency distributions obtained from 140 subsamples are presented in figures 11-8 to 11-42. The plots show a log-log histogram as well as a cumulative curve. Distributions not labelled "Hydrometer Test" were determined by settling tube and sedigraph methods. Grain size statistics and percent gravel, sand silt and clay are presented in tables 11-5 to 11-7.

Muddy facies (facies 1, 2 and 3) are commonly silty clays or clayey silts whereas sandy facies (facies 4 and 5) are often silty sands, sandy silts or sands. Laminated units (facies 7) are commonly silty clays or clayey silts. The above size classifications are based on the classification scheme of Shepard (1954).

Standard deviation values for all facies indicate the sediments are typically very poorly sorted. Facies 1, 2 and 3 sediments are commonly near symmetrical to positively skewed whereas facies 4, 5 and 7 normally show very positive skewness. Kurtosis values indicate that sediments of facies 1, 2, 3 and 7 range from platykurtic to leptokurtic. Facies 4 and 5 sediments are typically leptokurtic to very leptokurtic. Standard deviation, skewness and kurtosis designations are based on the classification scheme of Folk and Ward (1957).

4. DISCUSSION

Results from miniature vane shear tests conducted onboard *CSS Hudson* cruise 82-028 indicate that sediment shear strength can be correlated with sedimentary facies. Massive, burrowed and pebbly muds/silty muds show relatively high sediment shear strengths (mean: 4.33 kPa). Conversely, massive sands/silts, graded sands/silts and laminated sands/silts and muds show relatively low "index" values for sediment shear strength (mean: 2.43 kPa).

In order to access down-fjord trends in sediment shear strength, values for all miniature vane shear test locations along the length of each core were averaged. Average shear strength values show a down-fjord decrease in mean sediment shear strength in Cambridge fjord and a clear down-fjord increase in sediment shear strength in Itirbilung fjord (fig. 11-43). Mean sediment shear strength values from McBeth fjord show no clear down-fjord trends (fig. 11-43).

Wet bulk density and water content results from the the 1983 subsample suites are also related to sedimentary facies. Massive, burrowed and pebbly muds/silty muds show relatively high water content values (mean: 63%) and low values for wet bulk density (mean: 16.09 kN/m^3. In contrast, massive sands/silts, graded sands/silts and laminated sands/silts and muds show relatively low water content values (mean: 38%) and high wet bulk densities (mean: 17.36 kN/m^3).

Wet bulk densities and water content values were also averaged along the length of each core in order to access down-fjord variation. Itirbilung fjord sediments show a clear down-fjord decrease with respect to mean wet bulk density and increase with respect to mean water content (fig. 11-43). Down-fjord wet bulk density and water content trends in McBeth and Cambridge fjords are less clear (fig. 11-43).

Data from Atterberg Limit tests conducted on the 1983 subsample suite show that, in a general sense, the plasticity properties vary according to facies. Massive, burrowed and pebbly muds/silty muds show relatively high plasticity values and a broad range from low to high plasticity. Massive and graded sands/silts are of relatively low plasticity. Laminated sands/silts and muds also show relatively low plasticity. Averaged core plasticity values show no clear down-fjord trends in Cambridge and McBeth fjords. However, mean plasticity values clearly increase down-fjord in Itirbilung fjord (fig. 11-44).

Down-fjord trends observed in the geotechnical properties of Cambridge, Itirbilung and McBeth fjord sediments can be interpreted in terms of proximity to fjord head and side entry systems. In Itirbilung fjord, the sandy facies (facies 4, 5 and 7) are more common in cores collected near the fjord head (*i.e.:* cores IT-0.1, IT-0.3 and

IT-0.4, fig. 11-3 and 11-4). These cores show low mean water contents, low mean plasticity values, low mean shear strengths and relatively high mean wet bulk densities. Graded sands are common in the proximal cores and are interpreted as thin turbidites which are probably generated from occasional slumping of oversteepened upper sandur slopes (Gilbert, 1982). The more distal cores (*i.e.:* cores IT-2.2 and IT-3.1, fig. 11-5 and 11-6), show relatively high mean water contents, high mean plasticity values, high mean shear strengths and low mean wet bulk densities and are largely represented by the finer-grained facies (facies 1, 2 and 3). These finer-grained facies are presumed to represent slow accumulation of flocculated silts and clays which settled out of suspension from near surface overflows (Gilbert, 1982).

Down-fjord trends in the geotechnical properties of Cambridge and Mcbeth fjord sediments are not as obvious as the trends observed in Itirbilung fjord. Four of the seven Cambridge fjord core stations (CA-1.1, CA-1.6, CA-4.2 and CA-6.0) and one of the four McBeth fjord core stations (MC-4.1) are located in close proximity to side entry systems. The absence of clear down fjord trends in the geotechnical properties observed in Cambridge and McBeth fjords are considered to be due to the location of the above core stations with respect to side entry systems. Presumably, sediments supplied to the fjord by side entry systems locally obscure general down-fjord facies and geotechnical trends.

5. SUMMARY

The Lehigh gravity coring program conducted onboard CSS *CSS Hudson* cruise 83-028 provided a total of 19 coresfor sedimentological and geotechnical analyses. The cored sediments have been tentatively classified into 7 facies: (1) massive muds / silty muds, (2) burrowed mud / silty muds, (3) pebbly muds / silty muds, (4) massive silts / sands, (5) graded silts / sands, (6) whispy-discontinuous silts / sands and (7) laminated silts / sands and muds.

An initial review of the geotechnical and sedimentological data suggests the following relationships:

1. Massive silts / sands, graded silts / sands, whispy-discontinuous silts / sands and laminated silts / sands are common in the cores collected in close proximity to fjord head or side entry systems. These sediments show relatively low shear strength, low plasticity, low water content and high wet bulk density.

2. The more distal cores largely consist of massive muds / silty muds, burrowed muds / silty muds and pebbly muds / silty muds. These sediments show relatively high shear strength, high plasticity, high water content and low wet bulk density.

3. The down-fjord distribution of facies and down-fjord trends in the geotechnical properties are locally influenced by side entry systems. In cases where the cored sediments are not influenced by side entry systems, shear strengths, water contents and plasticity values increase whereas wet bulk densities decrease down-fjord.

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TABLE 11-1. Cambridge Fjord Geotechnical Data

Core Depth (cm)	G.T. no.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Wet Bulk Density (kN/m^3)	Undisturbed Shear Strength (kPa)	Remoulded Shear Strength (kPa)	Facies
CORE CA-0.2									
0-3	GT-111	62	59.8	29.2	30.6	15.21	dist.	dist.	3
8	GT-112	35	27.3	24.1	3.2	18.21	3.82	2.10	1
16	GT-113	36	31.3	24.4	6.9	17.39	6.57	0.67	1
CORE CA-1.1									
0-3	GT-121	80	54.5	29.7	24.8	14.90	dist.	dist.	3
24	GT-122	61	42.4	27.7	14.7	13.91	4.39	N.P.	4
64	GT-123	64	49.3	28.6	20.7	16.12	6.00	0.56	1
104	GT-124	67	51.2	28.6	22.6	15.78	3.43	0.48	1
144	GT-125	78	53.2	26.8	26.4	15.03	4.39	0.38	2
184	GT-126	49	37.0	24.1	12.9	19.35	3.15	N.P.	2
214	GT-127	46	35.1	24.8	10.3	17.38	2.77	0.85	2
CORE CA-1.2									
0-4	GT-128	80	45.0	25.4	19.6	11.86	dist.	dist.	1
53	GT-129	59	49.4	28.4	21.0	16.15	6.39	1.15	1
91	GT-130	50	44.7	24.1	20.6	16.60	4.29	0.38	2
109	GT-131	50	39.8	19.8	20.0	16.90	5.52	0.85	5
157	GT-132	55	40.8	25.2	15.6	16.57	5.24	0.57	2
192	GT-133	46	34.7	26.6	8.1	16.50	3.90	N.P.	2
CORE CA-1.6									
1-4	GT-114	58	51.7	31.2	20.5	15.87	dist.	dist.	1
30	GT-115	70	57.8	32.4	25.4	15.64	4.10	0.38	2
45	GT-116	72	51.8	32.4	19.4	15.59	3.52	0.56	2
61	GT-117	31	N.P.	N.P.	N.P.	17.24	N.P.	N.P.	5
85	GT-118	56	42.2	27.0	15.2	16.48	3.43	0.77	2
110	GT-119	50	34.3	23.6	10.7	16.94	6.96	0.67	2
125	GT-120	46	32.0	22.0	10.0	17.48	4.00	0.41	2
CORE CA-4.1									
1-4	GT-104	91	57.2	34.1	23.1	14.67	dist.	dist.	1
25	GT-105	66	44.3	26.9	17.4	15.83	2.29	1.15	1
50	GT-106	83	52.1	29.0	23.1	15.30	3.43	0.57	1
83	GT-107	45	35.0	23.2	11.8	17.36	4.95	0.38	5
106	GT-108	75	51.5	29.2	22.3	15.40	3.82	0.28	1
125	GT-109	72	50.0	28.4	21.6	15.64	5.34	0.57	1
151	GT-110	78	59.8	29.2	30.6	15.29	3.62	0.38	1
CORE CA-4.2									
0-3	GT-94	35	N.P.	N.P.	N.P.	16.38	dist.	dist.	4
30	GT-95	29	N.P.	N.P.	N.P.	12.70	2.67	0.37	4
45	GT-96	27	N.P.	N.P.	N.P.	18.45	0.82	N.P.	5
58	GT-97	67	40.9	23.6	17.3	15.90	2.85	0.67	1
65	GT-98	34	28.8	18.1	10.7	18.00	2.67	0.95	4
75	GT-99	34	N.P.	N.P.	N.P.	14.30	3.43	1.33	5
93	GT-100	70	59.8	29.6	30.2	15.62	4.57	0.77	1
108	GT-101	33	25.9	21.4	4.5	18.31	2.67	0.67	4
123	GT-102	67	42.3	24.3	18.0	16.08	2.67	0.20	1
143	GT-103	62	43.0	24.7	18.3	16.23	4.29	1.71	1

TABLE 11-1 continued. Cambridge Fjord Geotechnical Data

Core Depth (cm)	G.T. no.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Wet Bulk Density (kN/m^3)	Undisturbed Shear Strength (kPa)	Remoulded Shear Strength (kPa)	Facies
CORE CA-6.0									
0-3	GT-134	90	47.1	27.1	20.0	14.81	dist.	dist.	1
35	GT-135	58	37.7	25.3	12.4	16.38	1.62	0.38	1
66	GT-136	57	35.5	24.0	11.5	16.83	2.10	0.38	7
93	GT-137	29	N.P.	N.P.	N.P.	16.22	2.00	0.57	5
132	GT-138	63	43.0	27.3	15.7	16.08	4.38	0.77	1
160	GT-139	69	44.0	25.0	19.0	15.67	3.38	N.P.	7
187	GT-140	63	41.9	26.1	15.8	15.85	2.00	0.28	7
203	GT-141	72	44.0	28.1	15.9	15.58	0.28	0.06	1
212	GT-142	42	27.0	22.2	4.8	17.67	1.81	N.P.	5
257	GT-143	71	49.9	30.5	19.4	15.77	7.05	0.67	1

TABLE 11-2. Itirbilung Fjord Geotechnical: Data

Core Depth (cm)	G.T. no.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Wet Bulk Density (kN/m^3)	Undisturbed Shear Strength (kPa)	Remoulded Shear Strength (kPa)	Facies
CORE IT-0.1									
0-3	GT-144	42	26.1	24.1	2.0	15.24	dist.	dist.	1
13	GT-145	30	23.4	20.6	2.8	18.99	1.05	0.57	5
45	GT-146	31	N.P.	N.P.	N.P.	18.78	0.77	0.57	7
62	GT-147	46	31.2	24.9	6.3	17.45	0.10	0.10	7
76	GT-148	44	28.1	25.1	3.0	17.44	0.95	0.28	7
105	GT-149	40	31.2	23.8	7.4	17.86	1.15	0.28	7
132	GT-150	45	N.P.	N.P.	N.P.	17.57	0.77	0.10	7
153	GT-151	41	36.0	25.9	10.1	17.69	1.52	0.85	7
170	GT-152	34	29.2	23.9	5.3	17.73	1.24	0.19	7
192	GT-153	39	29.2	24.5	4.7	17.91	2.38	0.28	7
215	GT-154	35	29.1	22.4	6.7	18.41	1.62	0.57	7
CORE IT-0.3									
0-3	GT-168	53	37.3	23.7	13.6	16.69	dist.	dist.	1
20	GT-169	36	31.7	20.2	11.5	18.28	1.90	0.38	4
36	GT-170	54	42.8	28.9	13.9	16.81	2.85	0.95	1
46	GT-171	32	N.P.	N.P.	N.P.	17.94	1.05	0.28	5
57	GT-172	48	37.4	25.6	11.8	17.30	2.67	1.33	7
68	GT-173	30	33.8	24.2	9.6	18.03	0.67	0.10	5
78	GT-174	28	N.P.	N.P.	N.P.	17.28	0.28	N.P.	5
95	GT-175	52	43.0	29.5	13.5	16.98	3.52	1.43	1
120	GT-176	50	41.1	28.5	12.6	17.08	3.52	1.81	7
133	GT-177	49	41.2	22.8	18.4	17.19	5.62	N.P.	1
CORE IT-0.4									
0-3	GT-178	43	36.3	27.7	8.60	14.45	dist.	dist.	1
23	GT-179	53	40.6	29.1	11.5	16.85	1.52	0.67	1
41	GT-180	28	N.P.	N.P.	N.P.	18.52	0.48	N.P.	5
53	GT-181	49	41.8	29.0	12.8	17.16	1.05	0.77	1
69	GT-182	27	N.P.	N.P.	N.P.	16.01	0.28	N.P.	5
97	GT-183	51	42.6	28.7	13.9	16.98	3.34	0.85	1
126	GT-184	47	40.1	26.1	14.0	17.32	4.00	1.43	1
134	GT-185	32	N.P.	N.P.	N.P.	16.39	1.15	0.10	5

TABLE 11-2 continued. Itirbilung Fjord Geotechnical Data

Core Depth (cm)	G.T. no.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Wet Bulk Density (kN/m^3)	Undisturbed Shear Strength (kPa)	Remoulded Shear Strength (kPa)	Facies
CORE IT-1.1									
0-3	GT-155	72	49.4	30.3	19.1	14.07	dist.	dist.	1
21	GT-156	40	31.2	23.8	7.4	17.68	4.10	1.72	1
62	GT-157	47	38.7	25.5	13.2	16.90	6.47	1.52	1
84	GT-158	36	28.4	24.0	4.4	17.37	4.77	1.15	4
102	GT-159	48	38.2	24.7	13.5	17.25	6.29	1.72	1
109	GT-160	37	27.7	25.8	1.9	18.15	4.00	0.77	5
135	GT-161	46	41.1	27.2	13.9	17.40	6.37	0.85	1
CORE IT-1.2									
0-4	GT-162	91	57.2	32.0	25.2	13.83	dist.	dist.	1
15	GT-163	48	44.0	25.3	15.7	17.13	3.82	1.72	1
51	GT-164	40	26.6	21.2	5.4	17.51	1.52	0.28	7
77	GT-165	34	N.P.	N.P.	N.P.	17.10	2.48	0.67	4
96	GT-166	40	28.5	25.9	2.6	17.68	3.14	0.28	7
112	GT-167	36	N.P.	N.P.	N.P.	18.74	2.95	N.P.	7
CORE IT-2.2									
0-3	GT-186	84	62.4	33.9	28.5	14.99	dist.	dist.	1
28	GT-187	39	36.2	25.2	11.0	17.32	3.15	1.05	5
48	GT-188	65	51.4	33.6	17.8	16.05	6.29	1.62	1
72	GT-189	34	N.P.	N.P.	N.P.	17.75	1.15	0.19	4
112	GT-190	71	61.9	35.8	26.1	15.59	7.42	2.10	1
153	GT-191	62	45.2	30.1	15.1	16.07	7.72	1.90	1
202	GT-192	67	49.8	30.9	18.9	15.79	1.90	1.90	1
CORE IT-2.3									
3-6	GT-200	137	80.2	46.6	33.6	13.19	dist.	dist.	1
34	GT-201	91	68.7	40.6	28.1	14.58	3.62	0.77	1
70	GT-202	70	59.5	35.0	24.5	15.55	5.52	1.62	1
115	GT-203	84	64.2	35.5	28.7	14.96	5.24	1.33	2
154	GT-204	86	73.1	41.4	31.7	14.81	6.29	1.90	2
193	GT-205	34	N.P.	N.P.	N.P.	17.96	5.52	1.72	5
217	GT-206	95	81.1	46.7	35.1	14.44	8.29	2.47	2
CORE IT-3.1									
0-4	GT-193	105	76.1	35.4	40.7	14.17	dist.	dist.	1
28	GT-194	83	60.0	33.9	26.1	14.80	4.77	2.00	1
80	GT-195	73	53.1	32.3	20.8	15.35	5.24	1.05	1
119	GT-196	62	61.8	35.8	26.0	16.02	5.91	1.81	1
159	GT-197	56	46.6	27.5	19.1	16.46	8.77	2.19	1
198	GT-198	64	46.1	27.8	18.3	15.99	4.19	1.43	1
239	GT-199	72	53.0	27.7	25.3	15.74	2.57	0.19	1

TABLE 11-3. McBeth Fjord Geotechnical Data

Core Depth (cm)	G.T. no.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Wet Bulk Density (kN/m³)	Undisturbed Shear Strength (kPa)	Remoulded Shear Strength (kPa)	Facies
CORE MC-0.1									
0-4	GT-222	69	53.2	30.6	22.6	15.19	dist.	dist.	1
23	GT-223	41	34.8	29.9	4.9	17.34	3.24	1.52	4
60	GT-224	54	42.2	32.0	10.2	16.68	2.85	0.95	2
105	GT-225	66	43.1	29.1	14.0	15.60	2.00	N.P.	5
139	GT-226	61	50.0	33.1	16.9	16.03	3.24	0.67	2
181	GT-227	45	38.5	26.9	11.6	17.30	2.57	1.05	2
202	GT-228	43	43.0	30.6	12.4	17.42	3.52	1.43	5
213	GT-229	67	54.2	34.2	20.0	16.26	3.52	1.52	2
CORE MC-2.0									
1-4	GT-214	79	56.4	34.2	22.2	15.08	dist.	dist.	1
11	GT-215	39	29.6	22.3	7.3	17.25	2.48	0.77	4
41	GT-216	61	50.0	30.9	19.1	16.09	2.85	1.15	1
80	GT-217	62	51.5	30.2	21.3	16.16	4.00	0.48	2
119	GT-218	55	50.0	30.5	19.5	16.67	5.52	1.81	2
160	GT-219	75	51.0	29.8	21.2	15.41	4.67	1.24	2
200	GT-220	80	56.9	33.7	23.2	15.23	3.90	1.52	2
230	GT-221	75	57.7	34.1	23.6	15.47	5.34	1.52	2
CORE MC-2.1									
0-3	GT-207	62	48.0	30.1	17.9	16.08	dist.	dist.	1
41	GT-208	50	39.9	25.9	14.0	17.12	3.05	1.72	1
72	GT-209	51	41.3	27.4	13.9	15.79	3.62	0.95	3
125	GT-210	49	40.1	25.5	14.6	17.52	4.00	1.05	2
161	GT-211	49	39.2	25.9	13.3	17.08	5.34	1.90	2
205	GT-212	38	31.2	25.1	6.1	18.02	4.67	1.52	2
227	GT-213	58	45.5	29.8	15.7	16.43	8.19	1.43	2
CORE MC-4.1									
0-3	GT-230	44	23.4	20.0	3.4	17.58	dist.	dist.	1
19	GT-231	26	N.P.	N.P.	N.P.	19.43	nil.	nil.	4
50	GT-232	41	26.0	23.3	2.7	17.77	3.34	1.52	7
85	GT-233	26	N.P.	N.P.	N.P.	19.30	2.77	0.67	4
128	GT-234	29	N.P.	N.P.	N.P.	18.97	0.95	0.48	4
161	GT-235	46	26.3	22.8	3.5	17.22	2.10	0.19	1
190	GT-236	39	28.0	21.7	6.3	17.78	2.85	0.67	1
220	GT-237	40	24.3	20.1	4.2	17.77	3.43	1.24	1

TABLE 11-4. Baffin Island Fjord and Atlantic Mean Geotechnical Values

	Maximum	Minimum	Mean	Mean (Facies 1,2,3)	Atlantic Mean[1]
Water Content (%)	137	26	59	63	86
Wet Bulk Density (Mg/m³)	1.98	1.21	1.68	1.64	1.52
Undisturbed Shear Strength (kPa)	8.77	nil	3.53	4.33	5.20
Remoulded Shear Strength (kPa)	2.47	nil	0.94	1.10	
Liquid Limit (%)	86.1	23.4	43.1	47.7	65.0
Plastic Limit (%)	46.6	12.6	27.7	29.9	27.0
Plastic Index	40.9	1.9	15.0	18.7	34.0

[1] From Keller and Bennett (1970)

TABLE 11-5. Cambridge Fjord Grain Size Data

Core Depth (cm)	G.T. no.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean (phi)	Standard Deviation (phi)	Kurtosis (no dim.)	Skewness (no dim.)
CORE CA-0.2									
8	GT-112	2.00	26.28	53.75	17.97	5.48	2.99	1.54	0.12
16	GT-113	1.20	17.48	62.42	18.92	5.98	2.64	1.30	0.08
CORE CA-1.1									
0-3	GT-121	2.12	11.72	48.21	37.95	7.02	3.17	1.21	0.00
24	GT-122	11.28	14.58	41.32	32.82	5.77	4.36	1.26	-0.29
64	GT-123	0.00	4.20	55.48	40.32	7.68	2.35	0.94	0.15
104	GT-124	0.00	2.27	54.21	43.52	7.94	2.34	0.97	0.27
144	GT-125	0.10	4.45	46.19	49.26	8.22	2.77	0.84	0.27
184	GT-126	0.00	1.78	57.62	40.60	7.82	2.30	1.02	0.34
214	GT-127	0.00	0.45	60.00	39.55	7.85	2.15	0.97	0.35
CORE CA-1.2									
0-4	GT-128	31.30	22.23	24.15	22.32	2.87	3.99	N.P.	N.P.
53	GT-129	0.05	3.98	56.25	39.72	7.64	2.36	0.94	0.22
91	GT-130	0.00	1.63	55.43	42.94	7.92	2.26	0.88	0.30
109	GT-131	0.15	4.13	43.04	52.68	8.38	2.73	0.82	0.17
157	GT-132	0.00	2.06	52.60	45.34	8.08	2.31	1.04	0.35
192	GT-133	0.00	1.03	64.02	34.95	7.59	1.98	0.92	0.30
CORE CA-1.6									
3-6	GT-114	0.40	17.17	42.01	40.42	7.16	3.04	0.93	-0.01
30	GT-115	0.00	7.70	46.42	45.88	7.87	2.60	0.97	0.14
45	GT-116	0.40	9.44	47.07	43.10	7.61	2.69	1.12	0.12
61	GT-117	0.00	72.61	16.91	10.48	3.92	2.58	1.86	0.67
85	GT-118	0.00	19.54	45.66	34.80	6.91	2.79	0.88	0.09
110	GT-119	0.00	27.33	46.37	26.29	6.23	2.81	0.83	0.23
125	GT-120	0.00	30.68	43.80	25.52	6.12	2.80	0.79	0.24

TABLE 11-5 continued.Cambridge Fjord Grain Size Data

Core Depth (cm)	G.T. no.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean (phi)	Standard Deviation (phi)	Kurtosis (no dim.)	Skewness (no dim.)
CORE CA-4.1									
1-4	GT-104	8.18	37.58	25.69	28.55	4.97	4.25	0.93	0.01
25	GT-105	0.10	20.15	38.61	41.13	7.12	3.19	0.89	0.07
50	GT-106	0.00	21.87	32.00	46.13	7.31	3.34	0.90	-0.09
83	GT-107	1.20	24.57	38.98	35.25	6.67	3.27	0.86	0.29
106	GT-108	0.02	8.51	45.14	46.33	7.78	2.61	0.87	0.06
125	GT-109	0.00	16.40	35.46	48.15	7.63	3.08	1.12	-0.07
151	GT-110	0.00	13.32	35.74	50.94	7.90	3.01	1.20	-0.05
CORE CA-4.2									
0-3	GT-94	0.00	81.08	10.58	8.33	3.18	1.58	2.48	0.42
30	GT-95	0.76	75.65	11.89	11.69	3.28	3.08	1.60	0.54
45	GT-96	4.60	67.91	14.57	12.92	3.11	3.59	1.56	0.31
58	GT-97	0.10	36.01	27.49	36.40	6.25	3.65	0.64	0.04
65	GT-98	9.49	53.05	16.89	20.56	3.73	4.18	1.02	0.47
75	GT-99	0.60	66.79	17.37	15.24	4.07	3.14	1.20	0.71
93	GT-100	0.90	16.38	34.61	48.11	7.48	3.34	0.94	-0.10
108	GT-101	0.20	49.78	40.75	9.27	4.52	2.17	1.97	0.40
123	GT-102	0.20	28.29	35.64	35.87	6.51	3.33	0.76	0.06
143	GT-103	0.00	26.56	34.96	38.49	6.70	3.33	0.60	-0.03
CORE CA-6.0									
0-3	GT-134	0.00	19.38	44.77	35.85	6.87	2.91	0.89	0.13
35	GT-135	0.00	13.19	51.29	35.51	7.07	2.75	0.90	0.31
66	GT-136	0.00	19.70	45.52	34.78	6.83	2.96	0.90	0.19
93	GT-137	0.20	56.31	36.96	6.53	4.30	1.99	1.74	0.42
132	GT-138	0.30	22.84	41.51	35.36	6.78	3.03	0.80	0.20
160	GT-139	0.10	14.37	44.66	40.87	7.34	2.90	0.85	0.14
187	GT-140	0.14	17.35	42.25	40.25	7.26	2.98	0.83	0.14
203	GT-141	0.00	0.54	26.70	72.76	9.42	2.02	0.94	0.11
212	GT-142	0.00	7.04	61.10	31.86	6.95	2.47	0.88	0.42
257	GT-143	0.00	9.55	42.26	48.19	7.90	2.76	0.94	0.09

TABLE 11-6. Itirbilung Fjord Grain Size Data

Core Depth (cm)	G.T. no.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean (phi)	Standard Deviation (phi)	Kurtosis (no dim.)	Skewness (no dim.)
CORE IT-0.1									
0-3	GT-144	0.00	18.29	58.27	23.44	6.29	2.56	1.04	0.45
13	GT-145	0.00	55.86	34.02	10.12	4.66	2.20	1.87	0.66
45	GT-146	0.00	32.26	46.75	20.98	5.93	2.66	1.01	0.58
62	GT-147	0.00	3.21	57.19	39.60	7.60	2.49	0.92	0.33
76	GT-148	0.00	14.73	57.80	27.47	6.59	2.61	0.94	0.43
105	GT-149	0.00	13.76	53.12	33.12	7.00	2.72	0.91	0.33
132	GT-150	0.15	44.43	41.08	14.34	5.10	2.45	1.45	0.65
153	GT-151	0.00	8.58	59.09	32.33	7.01	2.60	0.92	0.38
170	GT-152	0.00	17.31	56.93	25.77	6.46	2.62	1.07	0.42
192	GT-153	0.00	16.12	61.09	22.78	6.33	2.46	1.11	0.44
215	GT-154	0.00	33.37	43.22	23.41	5.29	1.98	0.73	0.43

TABLE 11-6 continued. Itirbilung Fjord Grain Size Data

Core Depth (cm)	G.T. no.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean (phi)	Standard Deviation (phi)	Kurtosis (no dim.)	Skewness (no dim.)
CORE IT-0.3									
0-3	GT-168	0.00	9.82	47.97	42.21	7.61	2.59	0.91	0.14
20	GT-169	0.00	21.71	46.50	31.79	6.70	2.75	0.76	0.25
36	GT-170	0.00	3.78	55.00	41.22	7.62	2.31	0.84	0.15
46	GT-171	0.00	37.27	46.23	16.51	5.46	2.40	1.04	0.58
68	GT-173	0.00	12.38	54.25	33.37	7.01	2.48	0.92	0.18
78	GT-174	0.10	74.18	22.61	3.10	3.81	1.41	1.73	0.41
120	GT-176	0.00	8.65	46.26	45.09	7.75	2.64	0.92	0.10
133	GT-177	0.82	4.84	46.95	47.39	7.90	2.73	0.96	0.15
CORE IT-0.4									
0-3	GT-178	0.00	8.74	60.11	31.15	6.93	2.49	0.87	0.38
23	GT-179	0.02	1.86	51.80	46.32	8.01	2.31	0.85	0.16
41	GT-180	0.00	33.08	57.20	9.72	5.08	1.95	1.69	0.51
53	GT-181	0.12	4.36	52.75	42.77	7.79	2.45	1.02	0.22
69	GT-182	0.18	50.21	43.79	5.82	4.51	1.69	1.97	0.56
97	GT-183	0.00	3.44	47.33	49.23	8.10	2.42	0.85	0.13
126	GT-184	0.00	9.20	45.97	44.83	7.69	2.77	0.98	0.12
134	GT-185	0.00	48.12	46.43	5.45	4.44	1.65	1.81	0.40
CORE IT-1.1									
0-3	GT-155	0.00	14.87	40.27	44.86	7.55	2.92	0.93	0.03
21	GT-156	0.40	27.03	35.87	36.69	6.67	3.31	0.83	0.11
62	GT-157	0.40	22.16	37.30	40.14	6.69	3.31	0.90	0.02
84	GT-158	0.40	26.03	40.89	32.68	6.45	3.27	0.89	0.12
102	GT-159	0.04	12.52	49.38	38.06	7.25	2.17	0.95	0.15
109	GT-160	0.60	26.95	48.45	24.01	6.08	2.70	0.86	0.42
135	GT-161	2.10	17.32	42.69	37.89	6.91	3.16	0.91	0.03
CORE IT-1.2									
0-4	GT-162	0.03	10.35	41.22	48.40	7.87	2.76	0.89	0.05
15	GT-163	1.30	23.37	38.21	37.12	6.76	3.28	0.81	0.08
51	GT-164	0.30	56.33	29.05	14.32	4.37	2.68	1.42	0.63
77	GT-165	0.10	53.72	30.98	15.20	4.85	2.68	1.23	0.62
96	GT-166	0.10	46.76	33.01	20.13	5.28	2.93	0.93	0.49
112	GT-167	0.00	35.47	41.20	23.33	5.88	2.80	0.83	0.35
CORE IT-2.2									
0-3	GT-186	0.30	9.51	47.31	42.87	7.56	2.78	0.91	0.12
28	GT-187	0.00	52.37	28.38	19.25	4.88	3.14	0.91	0.50
48	GT-188	0.28	15.57	43.56	40.42	7.19	2.98	0.88	-0.01
72	GT-189	1.40	78.42	11.26	8.92	3.24	2.68	2.60	0.69
112	GT-190	0.20	10.96	46.35	42.50	7.50	2.74	0.92	0.08
153	GT-191	0.05	30.43	34.23	35.29	5.51	2.53	0.83	0.14
202	GT-192	0.47	32.57	23.11	43.84	6.57	3.69	0.71	-1.70
CORE IT-2.3									
3-6	GT-200	0.00	11.18	39.86	48.95	7.80	2.74	1.01	-0.02
34	GT-201	2.70	17.83	36.58	42.89	7.05	3.43	0.93	-0.09
70	GT-202	1.06	18.67	41.27	39.00	7.06	3.07	0.83	0.06
115	GT-203	0.05	24.93	36.89	38.13	6.84	3.23	0.79	0.01
154	GT-204	0.00	15.06	41.06	43.89	7.48	2.95	1.02	0.05
193	GT-205	0.39	70.31	16.34	12.96	3.53	3.17	1.16	0.68
217	GT-206	0.02	9.26	42.27	48.45	7.88	2.73	0.96	0.02

TABLE 11-6 continued. Itirbilung Fjord Grain Size Data

Core Depth (cm)	G.T. no.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean (phi)	Standard Deviation (phi)	Kurtosis (no dim.)	Skewness (no dim.)
CORE IT-3.1									
0-4	GT-193	0.00	10.86	42.69	46.45	7.64	2.71	0.88	0.01
28	GT-194	0.00	18.99	45.19	35.81	6.86	2.79	0.78	0.12
80	GT-195	7.40	16.90	45.49	30.21	6.00	3.66	1.37	-0.04
119	GT-196	0.00	17.90	46.54	35.56	6.89	2.80	0.83	0.14
159	GT-197	0.00	15.04	47.94	37.02	7.10	2.83	0.87	0.18
198	GT-198	0.00	7.88	41.96	50.16	8.05	2.65	0.93	0.10
239	GT-199	0.00	2.99	40.71	56.30	8.52	2.45	0.95	0.08

TABLE 11-7. McBeth Fjord Grain Size Data

Core Depth (cm)	G.T. no.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mean (phi)	Standard Deviation (phi)	Kurtosis (no dim.)	Skewness (no dim.)
CORE MC-0.1									
0-4	GT-222	0.30	3.37	43.63	52.70	8.28	2.39	0.99	0.12
23	GT-223	0.05	6.56	58.10	35.28	7.26	2.45	0.96	0.20
60	GT-224	0.00	6.17	47.25	46.58	7.86	2.51	0.94	0.09
105	GT-225	1.10	16.95	43.13	38.82	6.95	3.31	1.18	-0.05
139	GT-226	0.00	3.65	51.38	44.97	7.88	2.38	0.93	0.14
181	GT-227	0.00	5.88	57.87	36.25	7.33	2.40	1.01	0.26
202	GT-228	0.00	2.82	50.18	47.00	7.99	2.35	0.94	0.14
CORE MC-2.0									
1-4	GT-214	0.00	11.03	41.34	47.63	6.67	2.07	N.P.	N.P.
11	GT-215	0.35	56.84	21.73	21.07	4.17	2.36	0.77	0.58
41	GT-216	1.86	23.87	30.51	43.76	5.86	2.88	0.81	-0.10
80	GT-217	0.06	18.85	36.13	44.96	6.29	2.55	0.87	-0.01
119	GT-218	0.00	22.29	37.01	40.70	6.04	2.32	0.68	0.06
160	GT-219	0.02	22.54	36.24	41.20	6.10	2.38	0.69	0.03
200	GT-220	0.00	13.10	38.20	48.70	6.71	2.16	N.P.	N.P.
230	GT-221	0.00	11.18	38.73	50.09	6.79	2.12	N.P	N.P.
CORE MC-2.1									
0-3	GT-207	0.00	11.16	51.87	36.97	6.35	1.87	N.P.	N.P.
41	GT-208	0.00	15.40	46.04	38.56	6.29	2.00	N.P.	N.P.
72	GT-209	0.00	14.89	45.33	39.78	6.37	2.00	0.88	0.16
125	GT-210	0.00	14.08	48.04	37.88	6.31	1.97	0.80	0.22
181	GT-211	0.00	12.98	47.96	39.06	6.35	1.92	0.86	0.22
205	GT-212	0.00	36.07	41.46	22.47	4.99	2.01	0.79	0.53
227	GT-213	0.00	12.30	50.09	37.61	6.23	1.93	N.P.	N.P.
CORE MC-4.1									
0-3	GT-230	0.00	55.18	29.13	15.69	4.30	1.98	1.28	0.59
19	GT-231	0.07	76.43	13.52	9.98	3.17	1.38	2.38	0.31
50	GT-232	0.04	52.89	27.38	19.69	4.46	2.13	0.96	0.63
85	GT-233	0.00	64.65	23.11	12.24	3.88	1.90	2.11	0.53
128	GT-234	0.00	61.52	25.78	12.70	4.01	1.90	2.32	0.52
181	GT-235	0.00	55.33	23.78	20.89	4.41	2.28	0.86	0.60
190	GT-236	0.78	58.17	23.01	18.05	4.21	2.15	1.10	0.61
220	GT-237	0.00	57.93	24.19	17.88	4.30	2.13	1.03	0.63

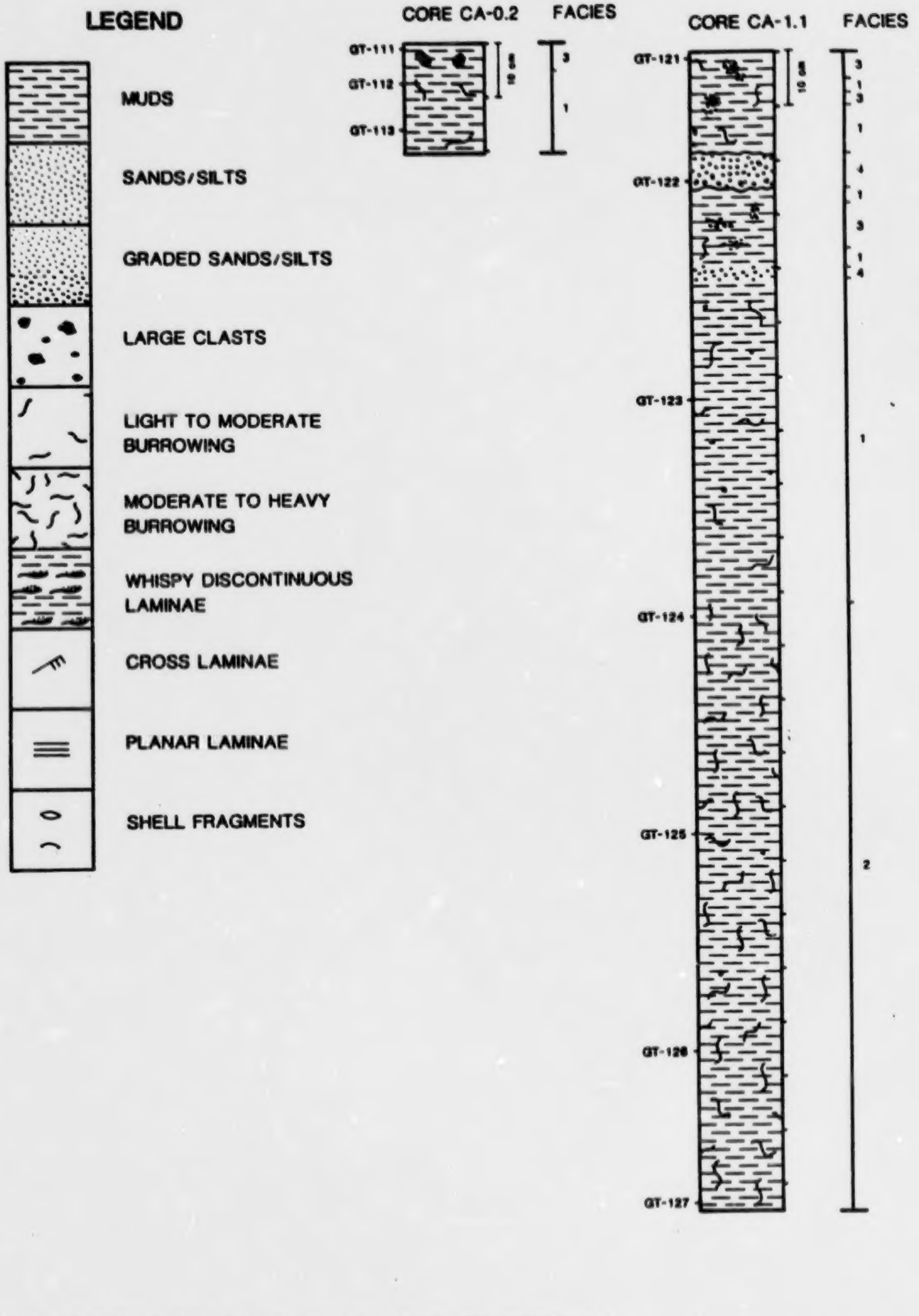


Fig. 11-1 Cambridge Fjord Cores and Facies Designations.

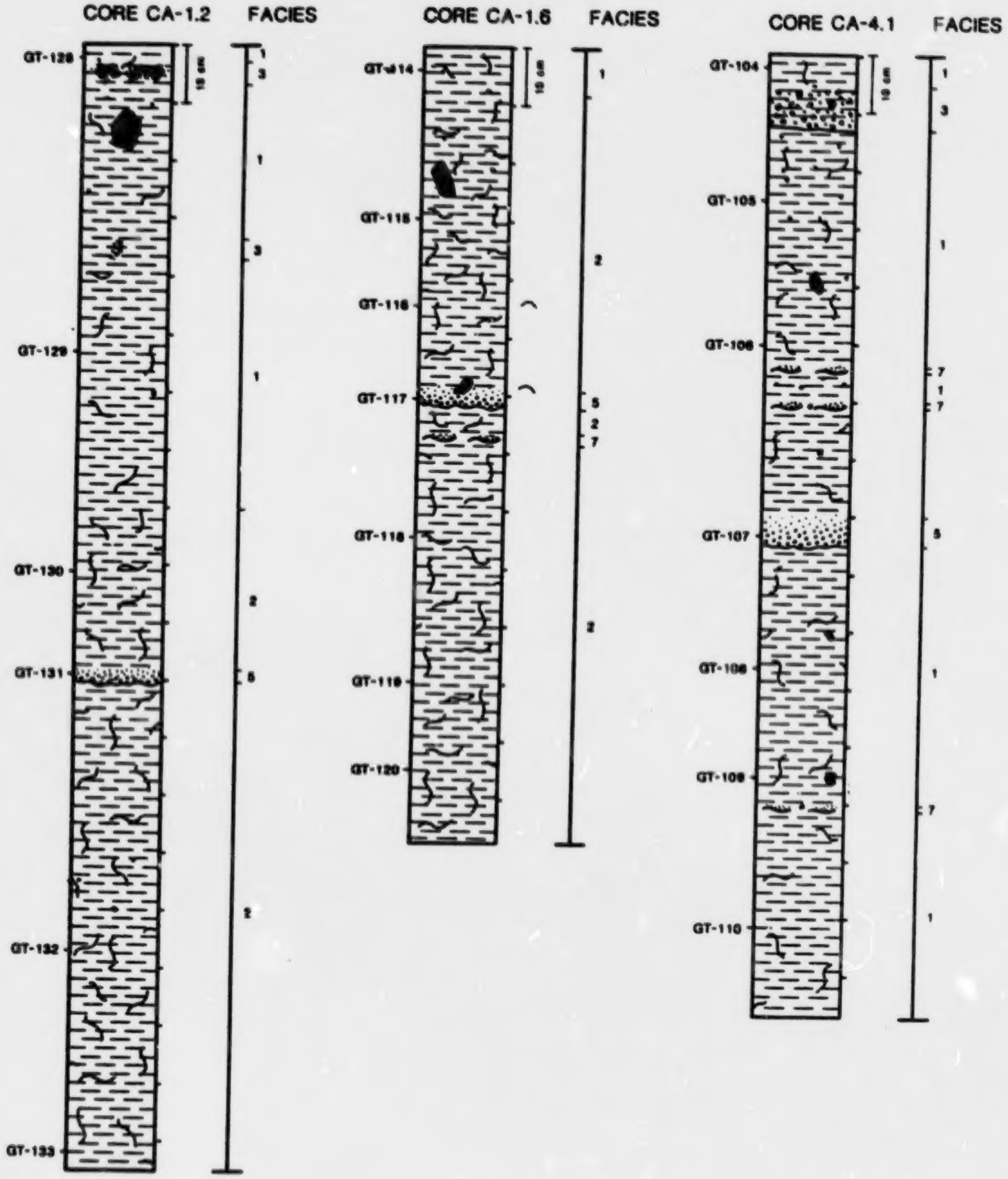


Fig. 11-2 Cambridge Fjord Cores and Facies Designations.

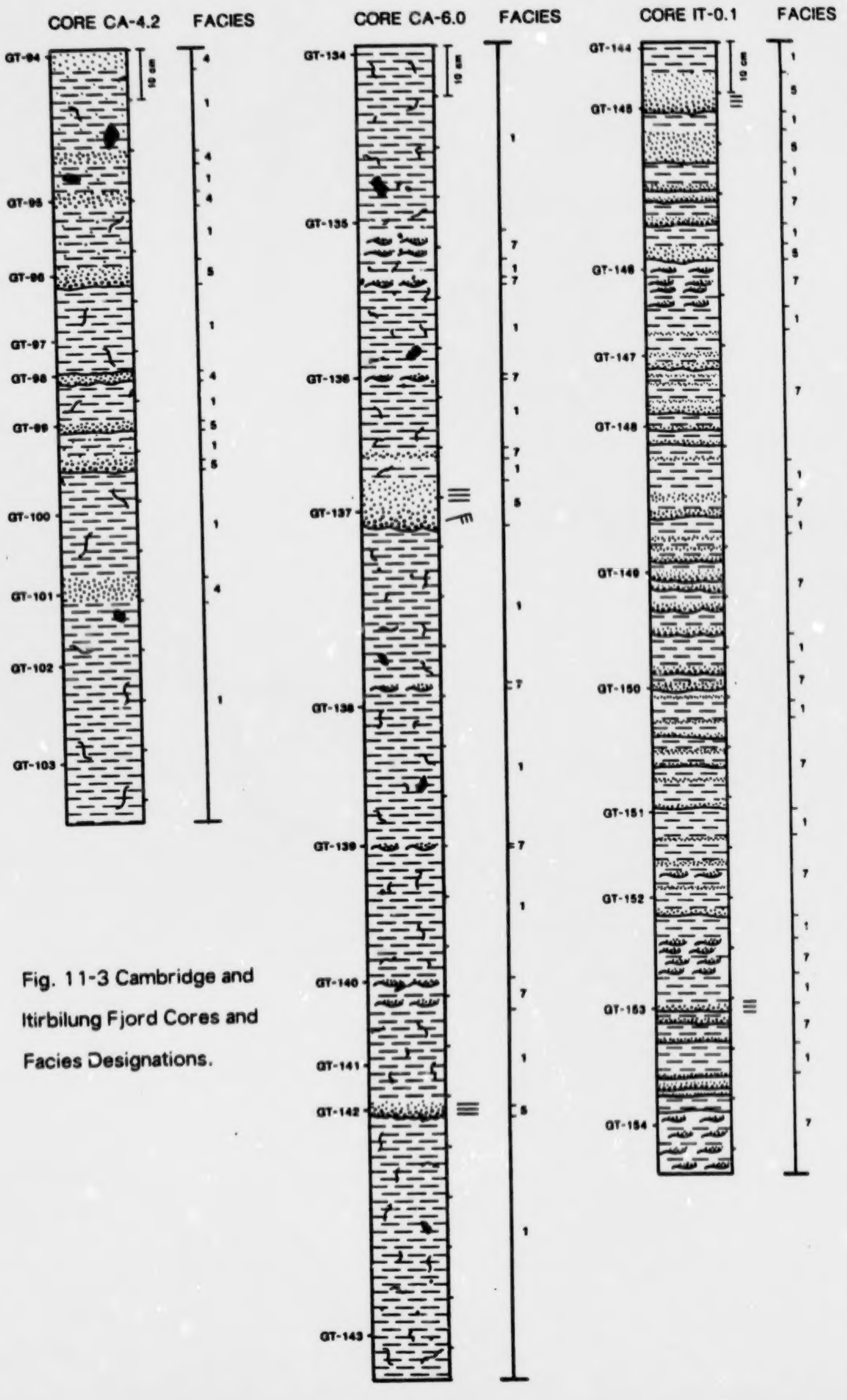


Fig. 11-3 Cambridge and Itirbilung Fjord Cores and Facies Designations.

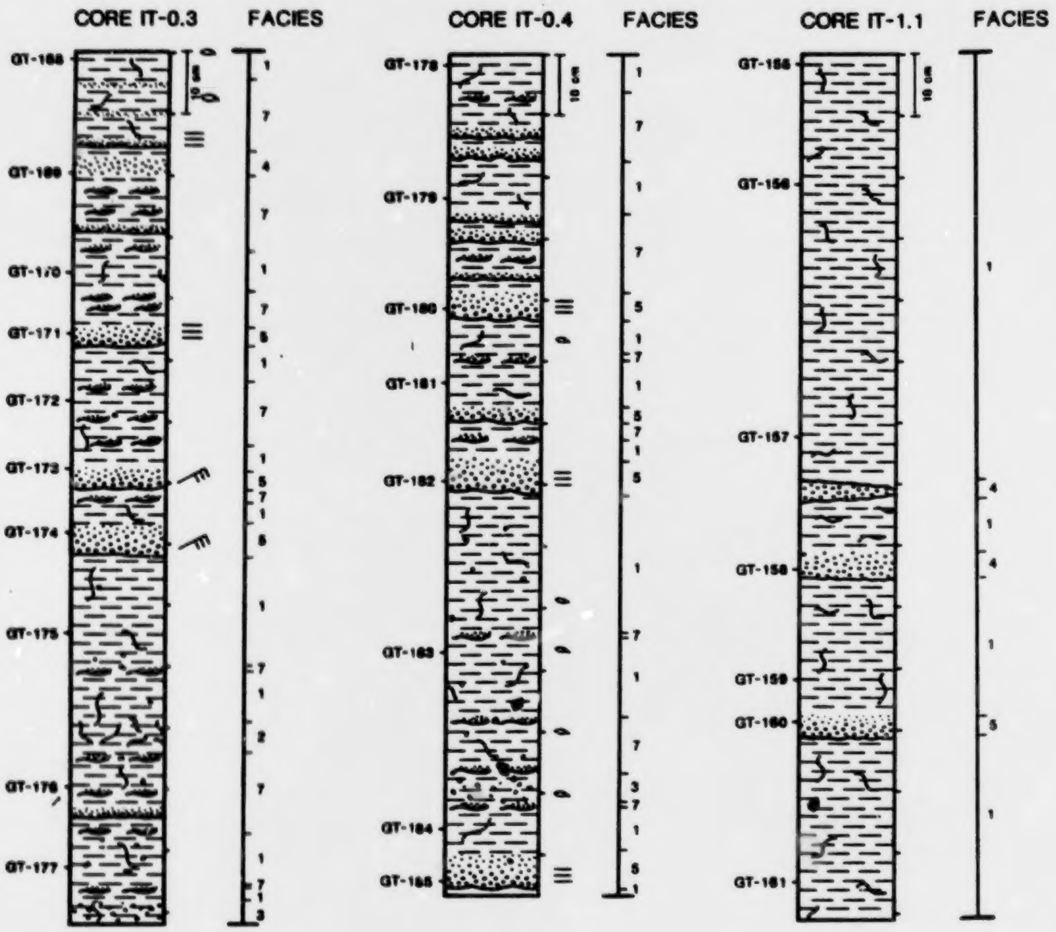


Fig. 11-4 Itirbilung Fjord Cores and Facies Designations.

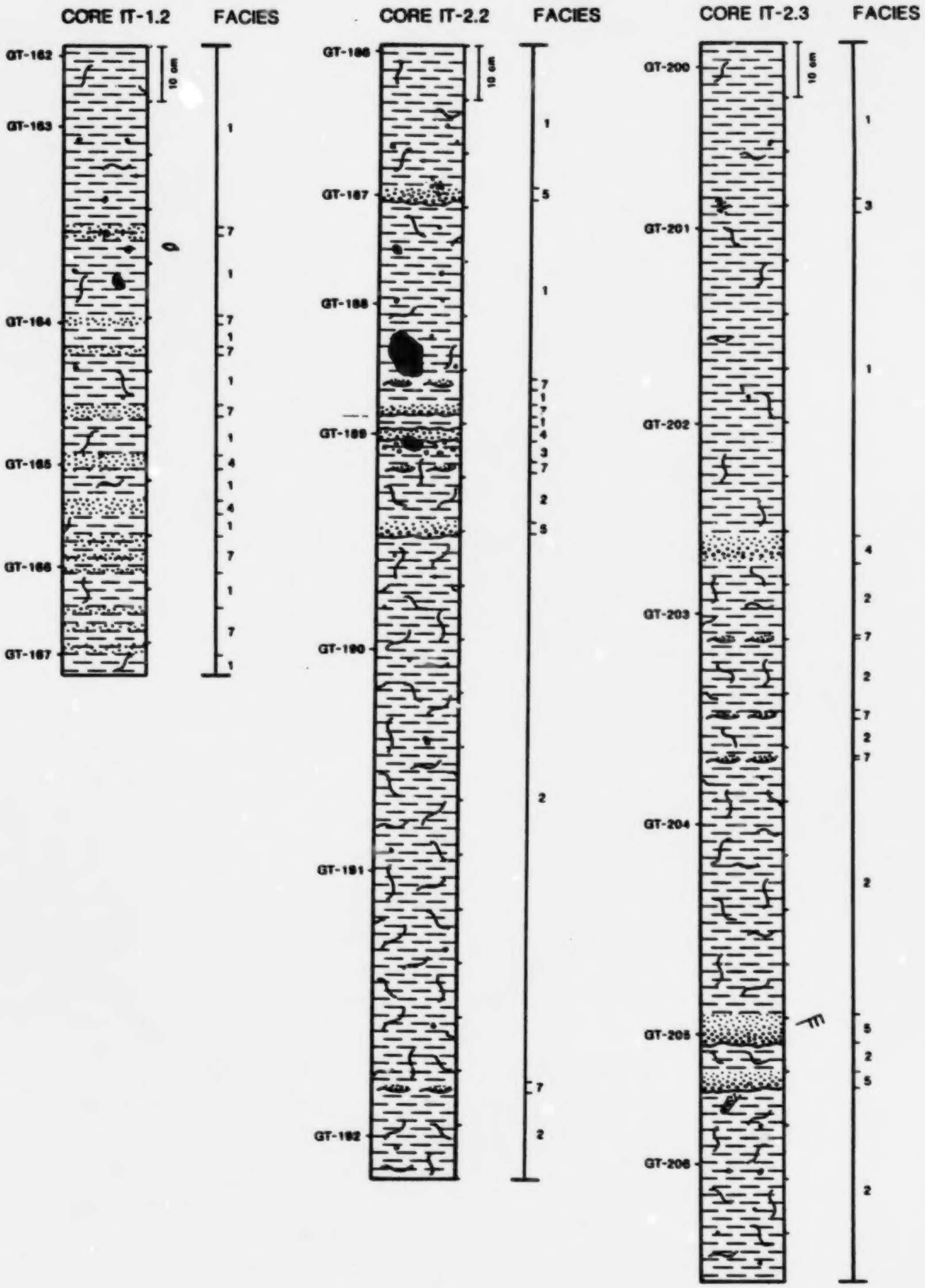


Fig. 11-5 Itirbilung Fjord Cores and Facies Designations.

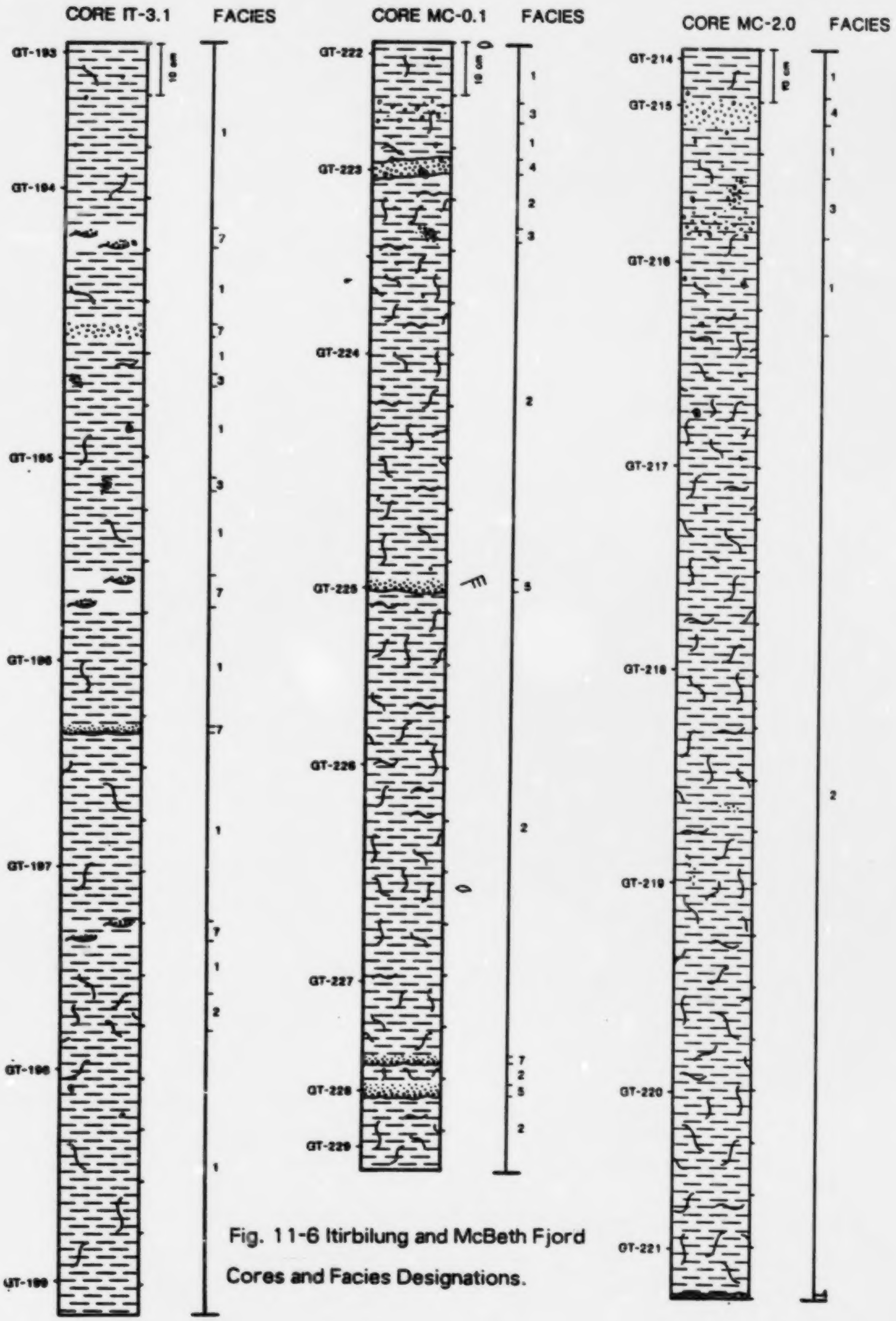


Fig. 11-6 Itirbilung and McBeth Fjord Cores and Facies Designations.

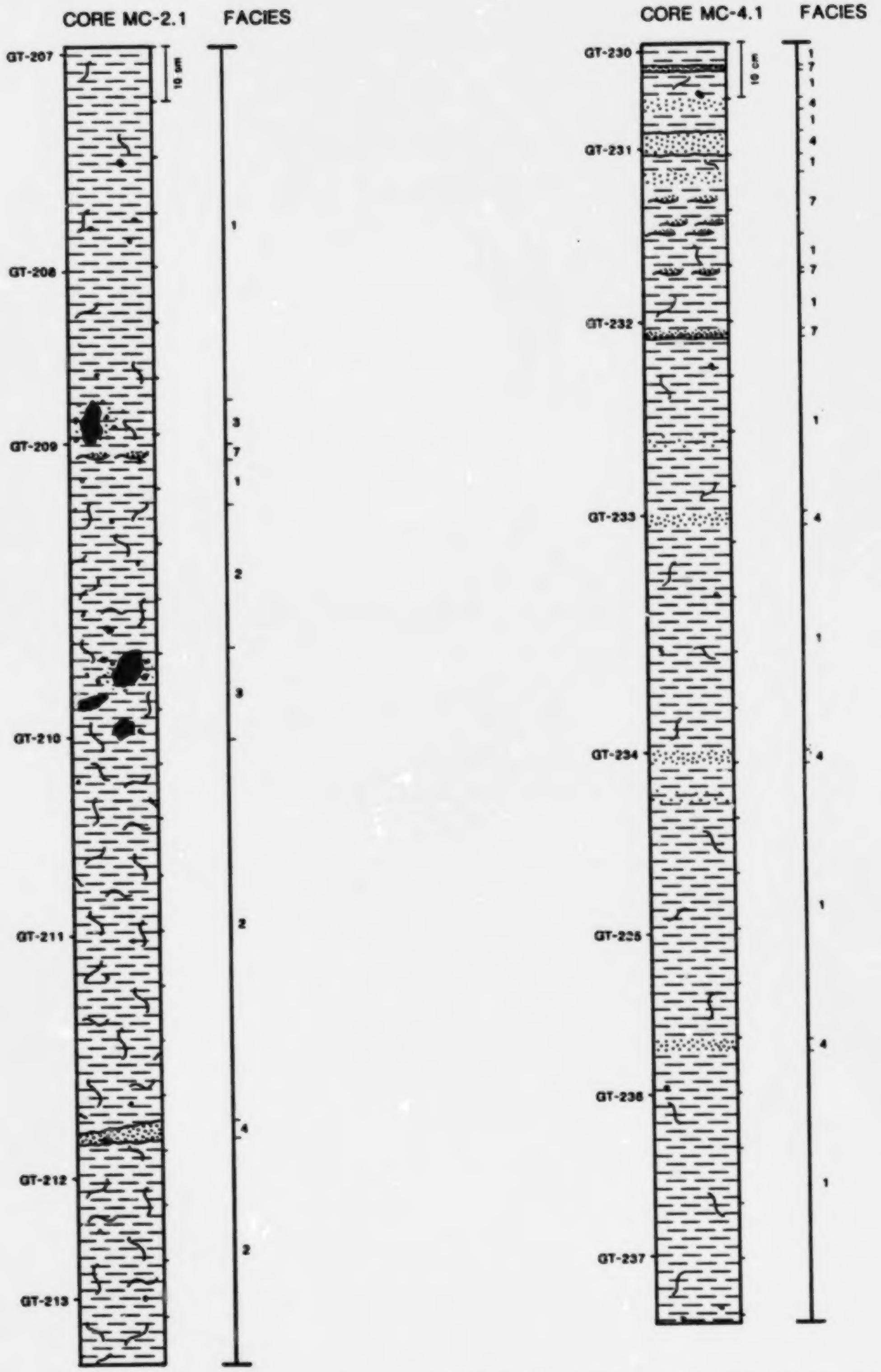


Fig. 11-7 McBeth Fjord Cores and Facies Designations.

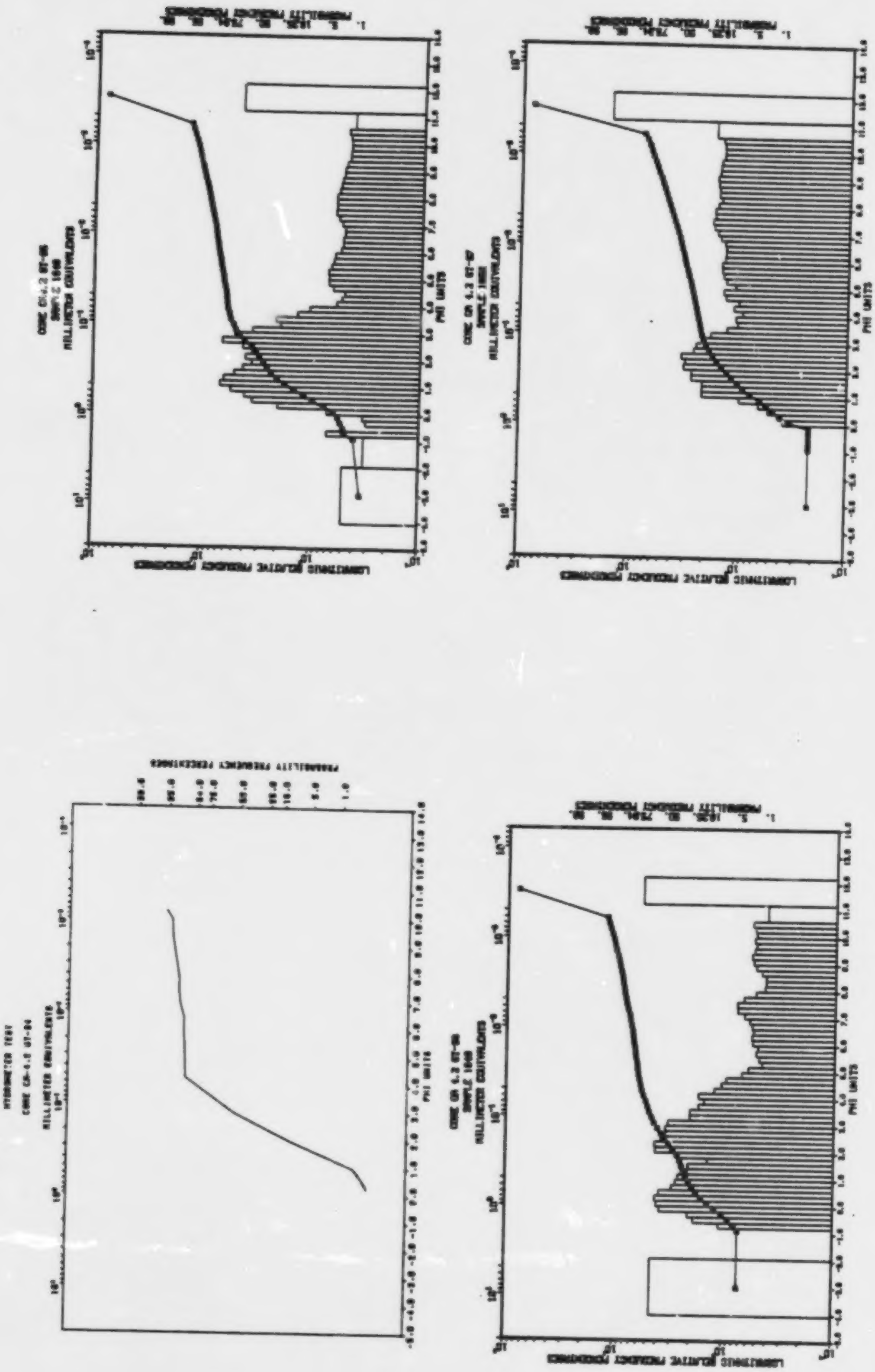
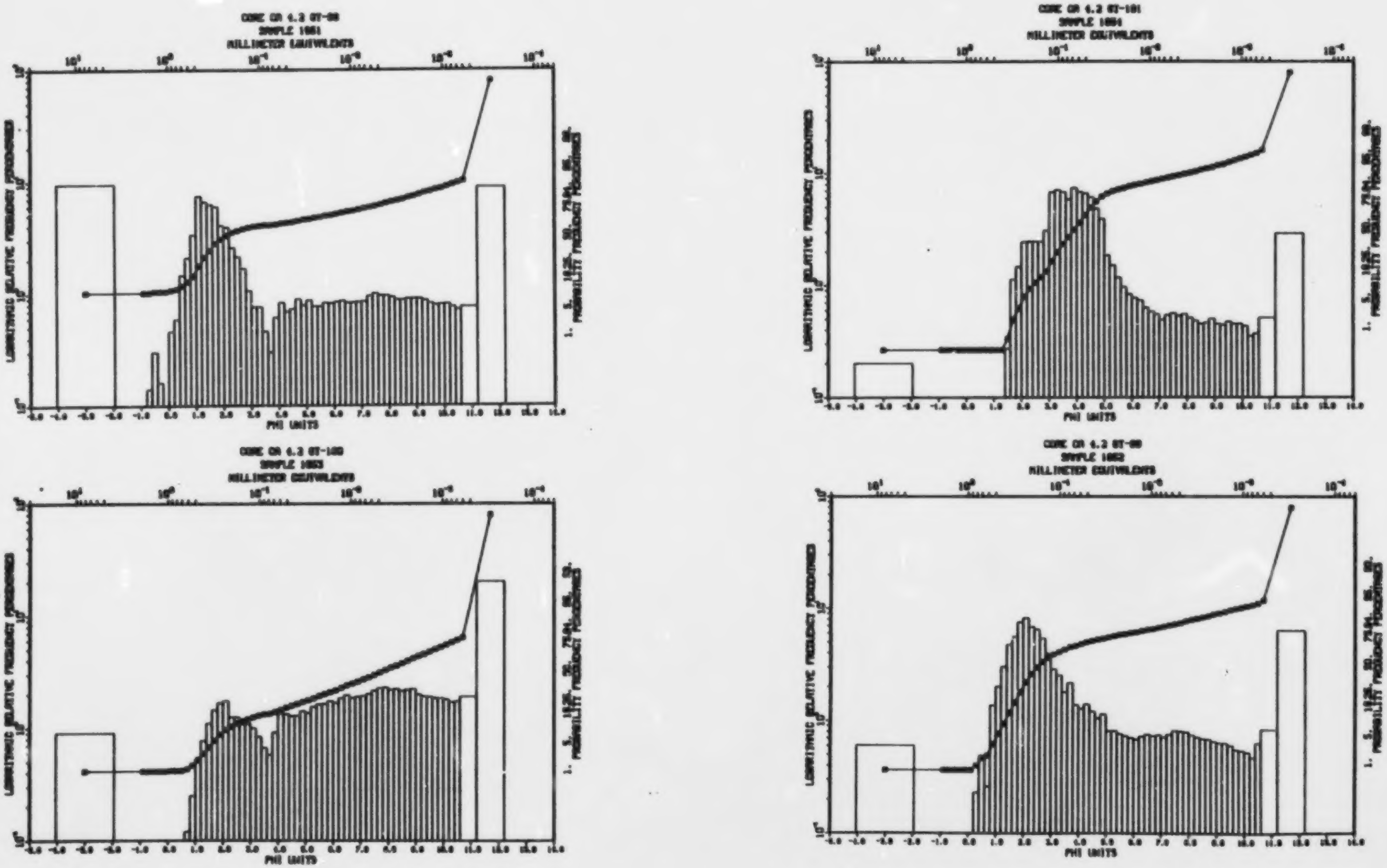

HYDROMETER TEST
MILLIMETER EQUIVALENTS
PHI UNITS
PROBABILITY FREQUENCY PERCENTAGES
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES

Fig. 11-8.


CORE GR 6.2 ST-99
SAMPLE 1881
MILLIMETER EQUIVALENTS
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SAMPLE 1884
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CORE GR 6.2 ST-100
SAMPLE 1883
MILLIMETER EQUIVALENTS
CORE GR 6.2 ST-99
SAMPLE 1882
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
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1. 5. 1020. 50. 7584. 95. 99.

Fig. 11-9.

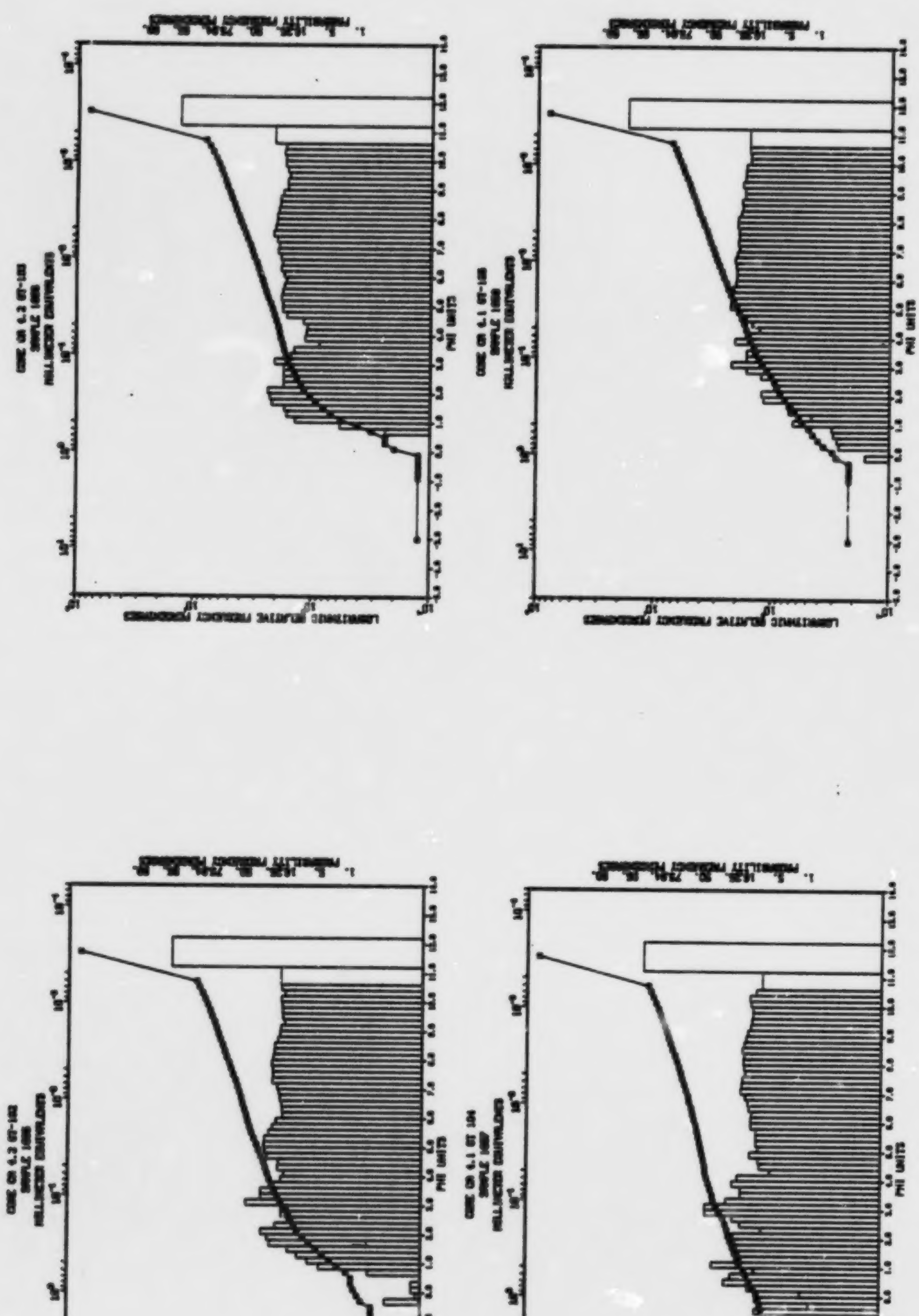

PHI UNITS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES

Fig. 11-10.

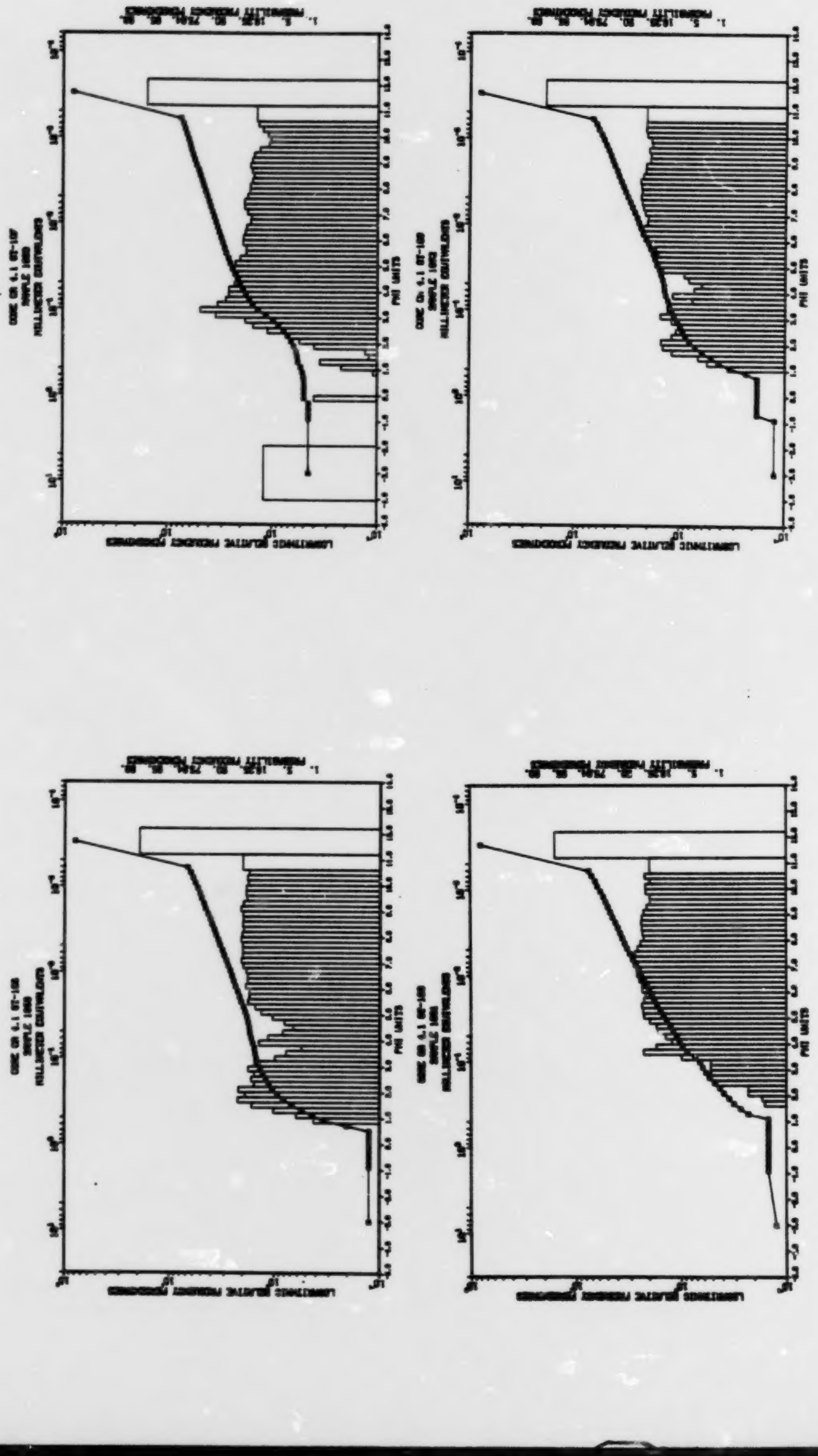


Fig. 11-11.

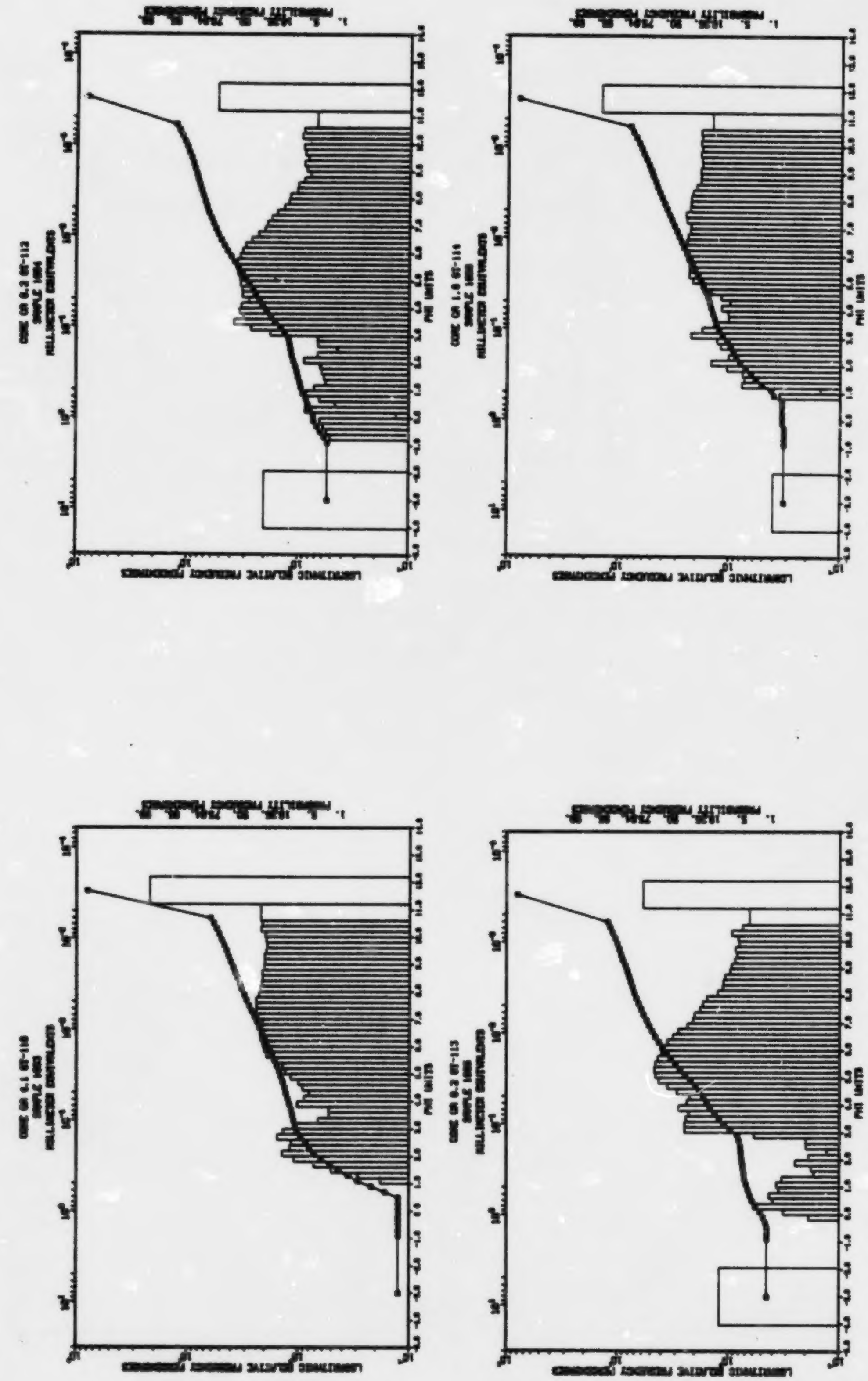

CORE GR 0.2 GT-112
MILLIMETER EQUIVALENTS
CORE GR 1.0 GT-114
MILLIMETER EQUIVALENTS
PHI UNITS

Fig. 11-12.

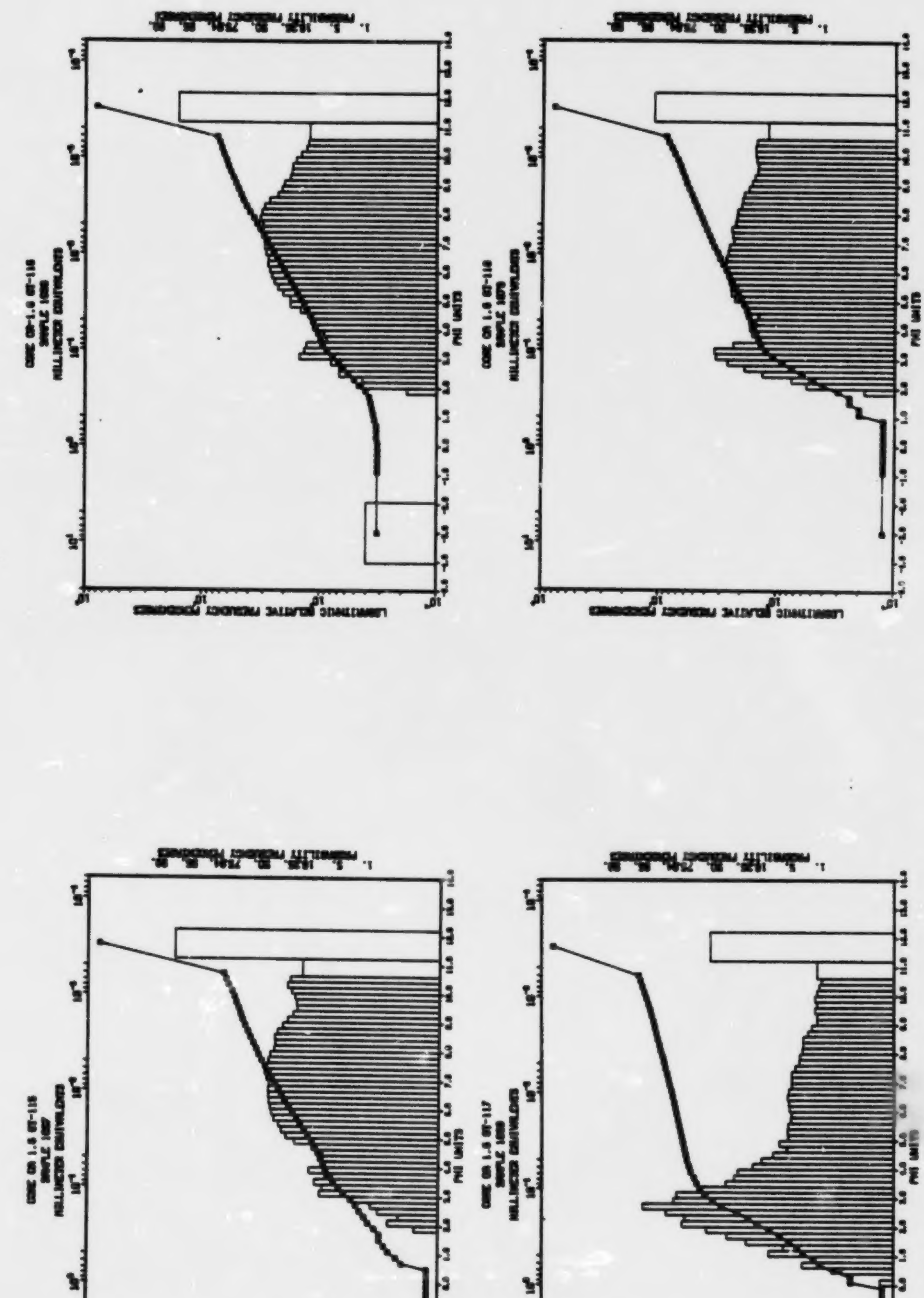

MILLIMETER EQUIVALENTS
PHI UNITS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES

Fig. 11-13.

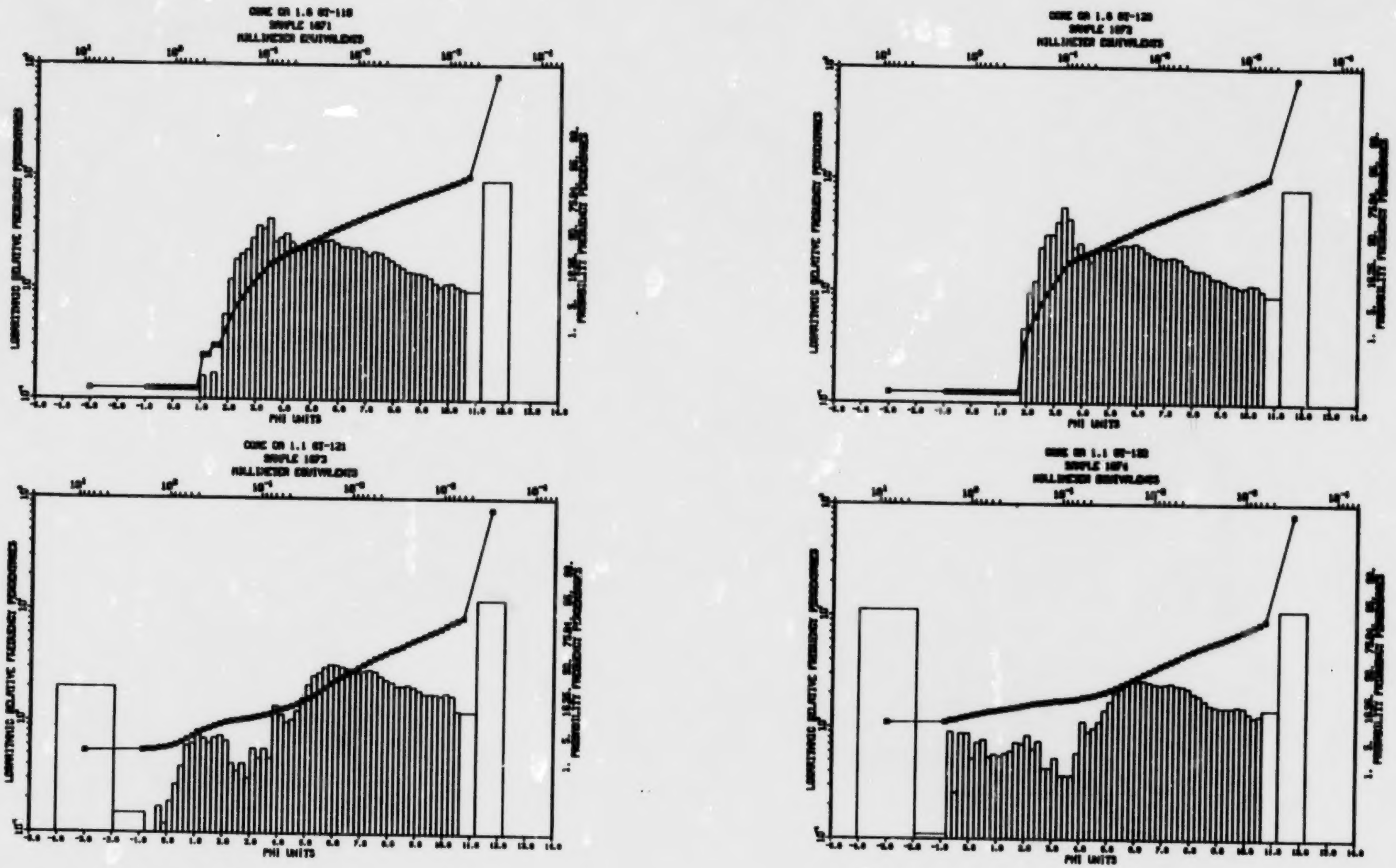

CORE GR 1.0 ST-110
SAMPLE 1071
MILLIMETER EQUIVALENTS
CORE GR 1.0 ST-120
SAMPLE 1072
MILLIMETER EQUIVALENTS
CORE GR 1.1 ST-121
SAMPLE 1073
MILLIMETER EQUIVALENTS
CORE GR 1.1 ST-120
SAMPLE 1074
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-14.

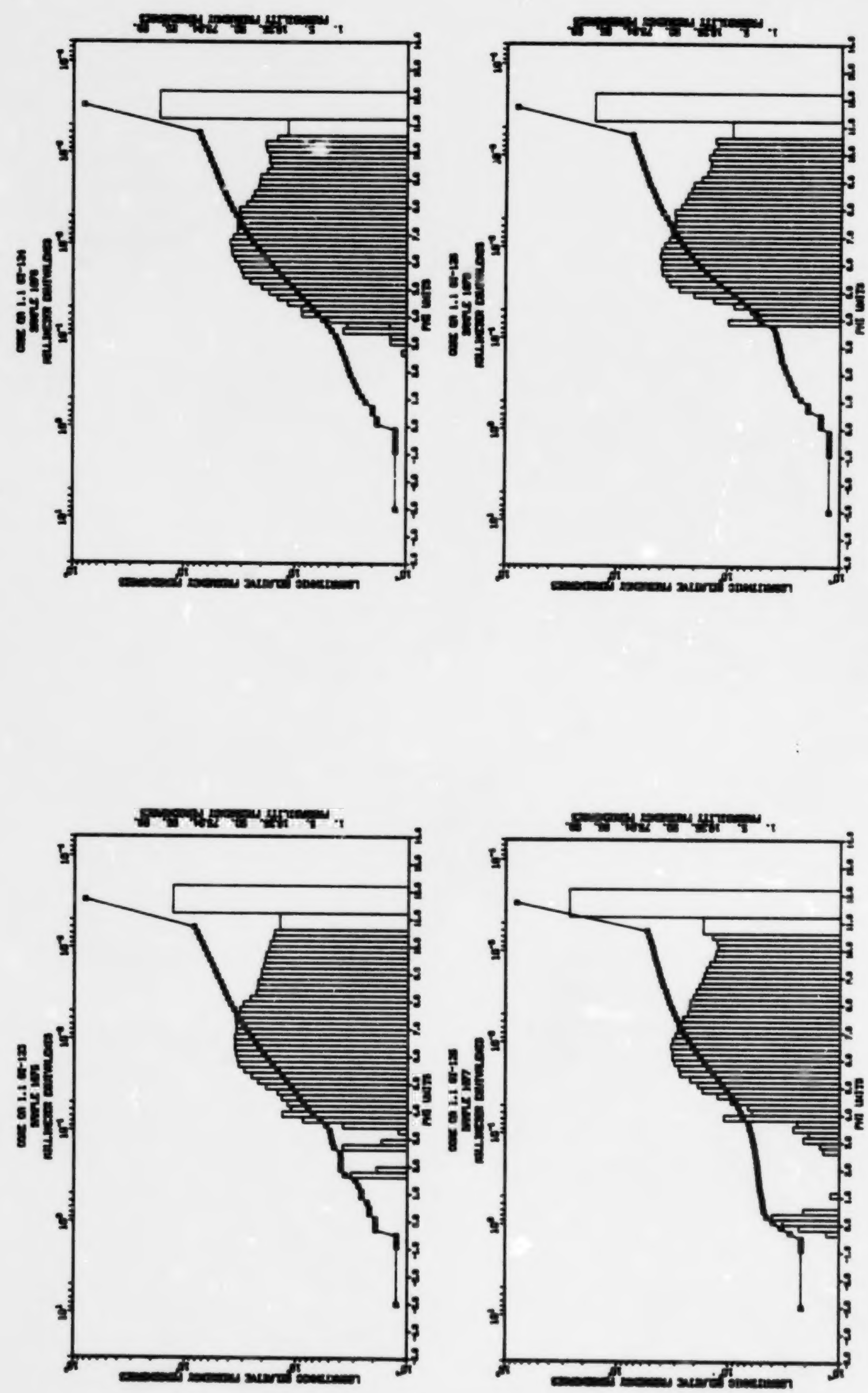


Fig. 11-15.

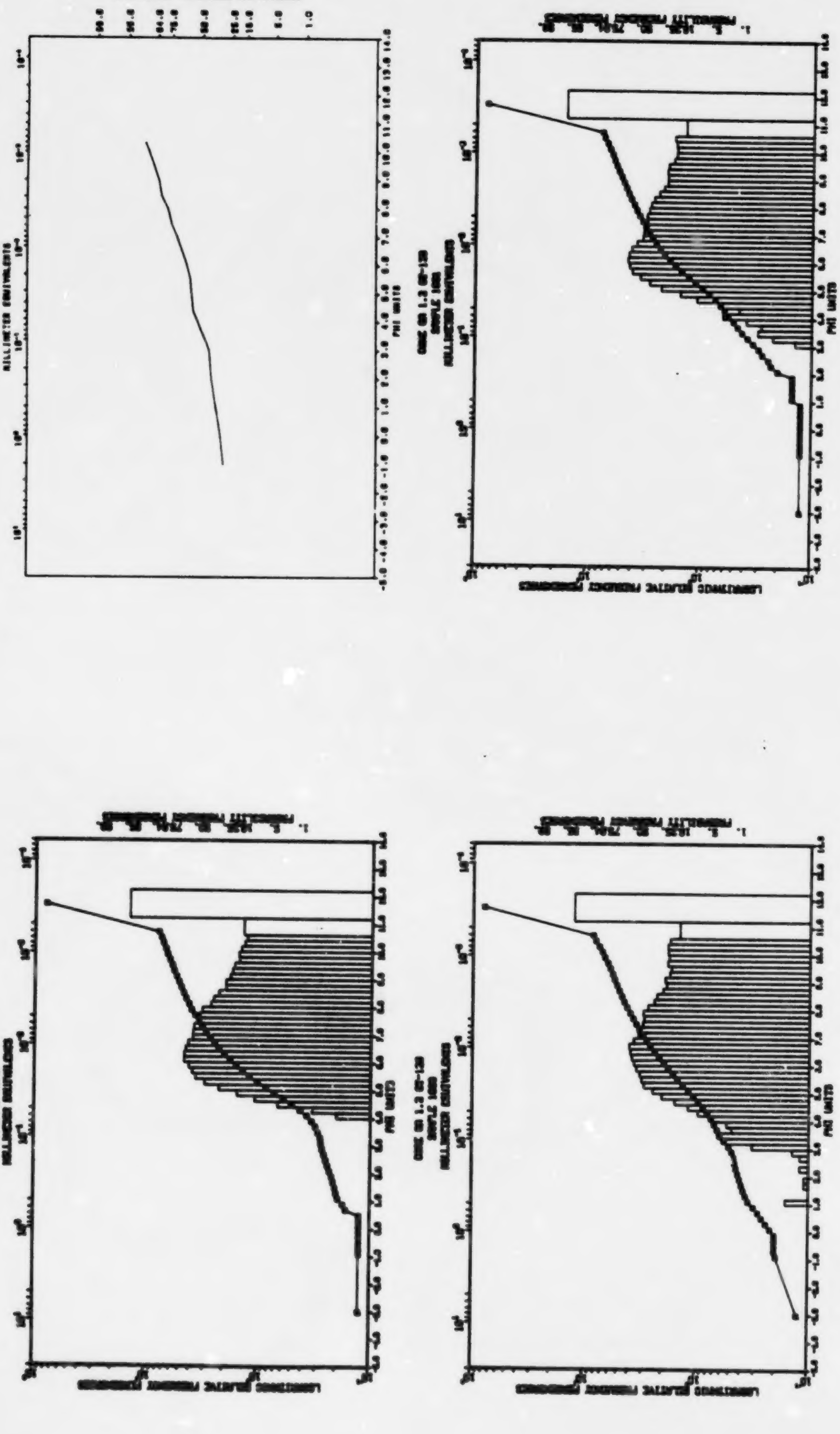

HYDROMETER TEST
MILLIMETER EQUIVALENTS
PHI UNITS
PROBABILITY FREQUENCY PERCENTAGES
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES

Fig. 11-16.

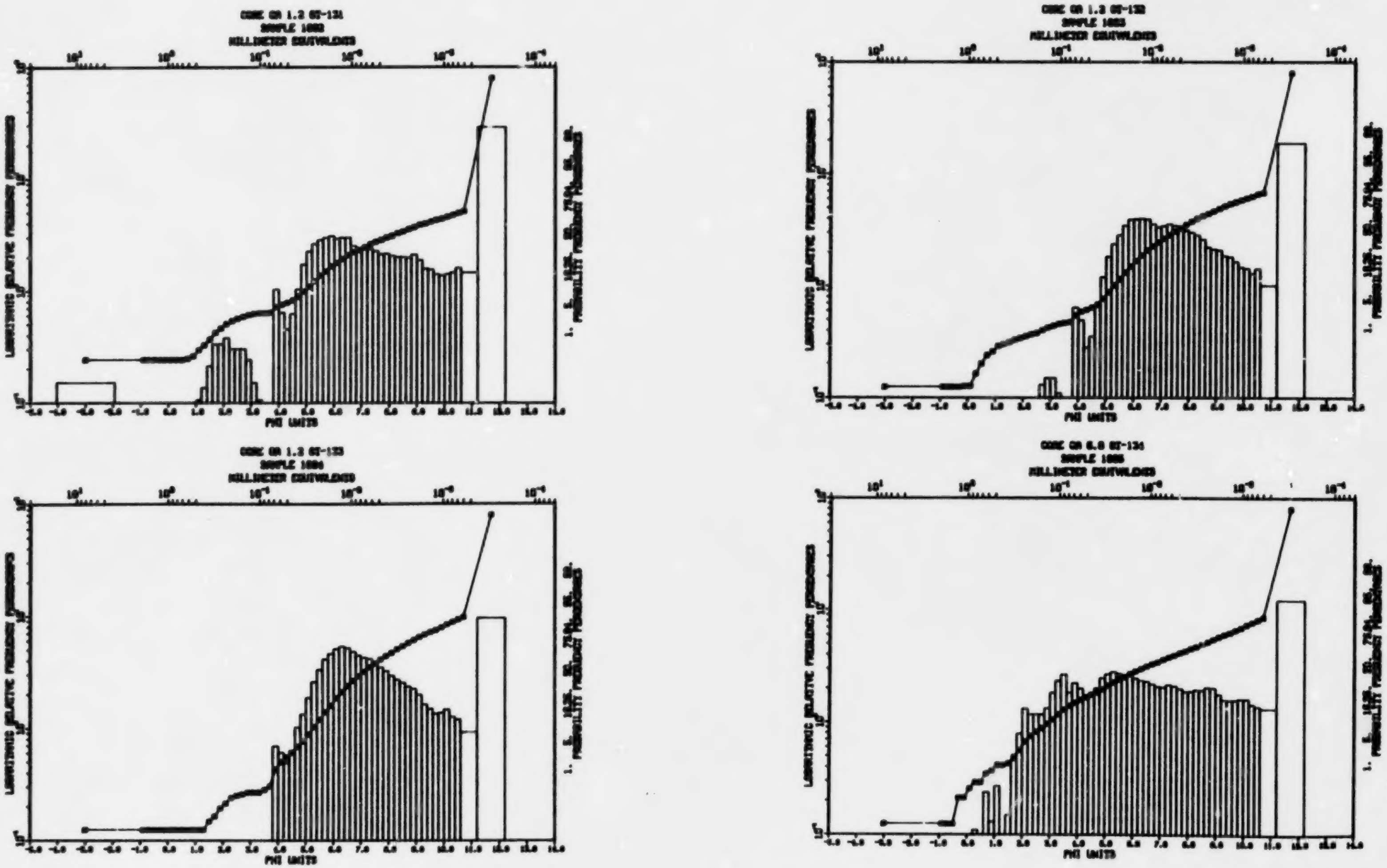

MILLIMETER EQUIVALENTS
PHI UNITS
MILLIMETER EQUIVALENTS
PHI UNITS
MILLIMETER EQUIVALENTS
PHI UNITS
MILLIMETER EQUIVALENTS
PHI UNITS

Fig. 11-17.

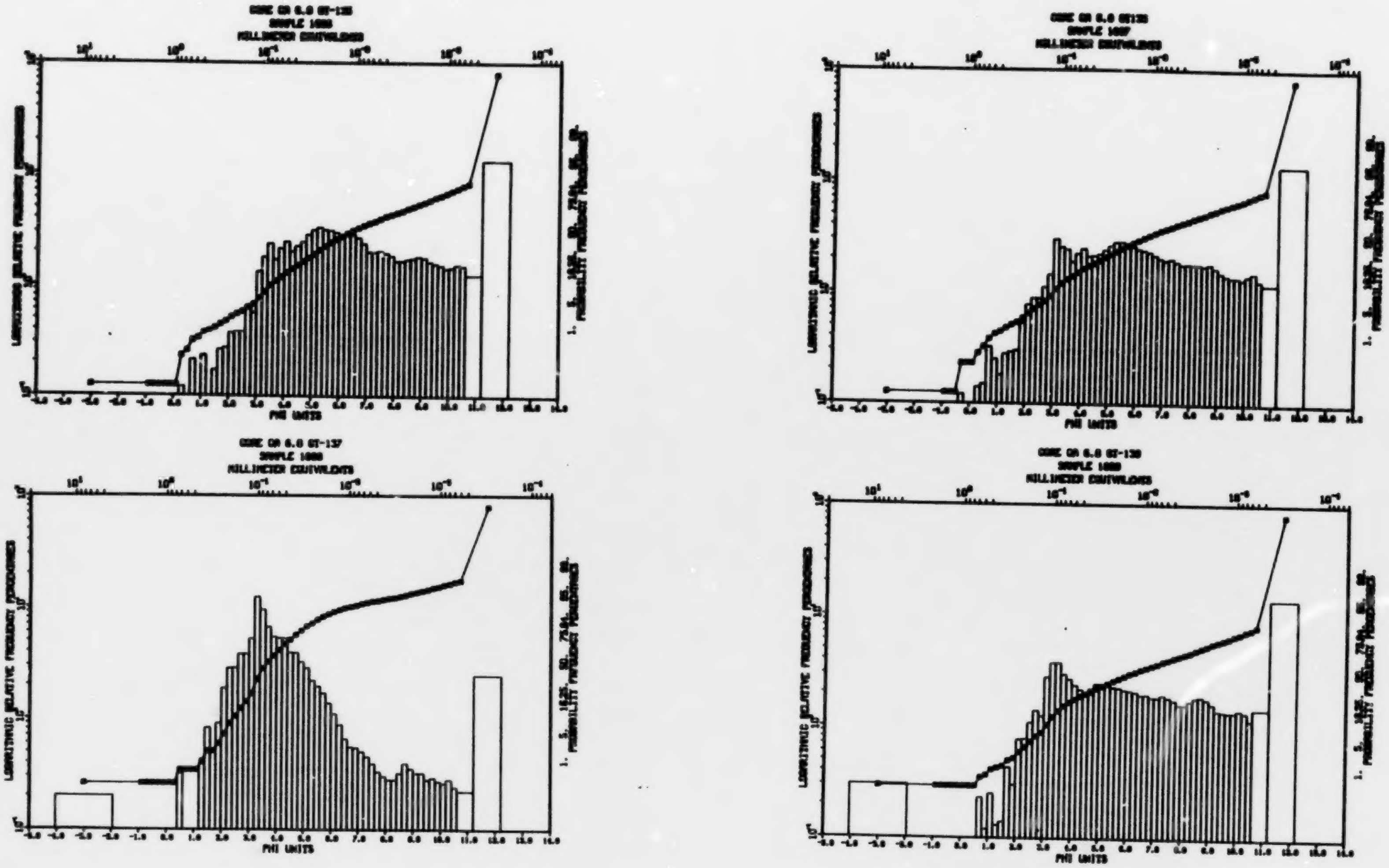

MILLIMETER EQUIVALENTS
PHI UNITS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES

Fig. 11-18.

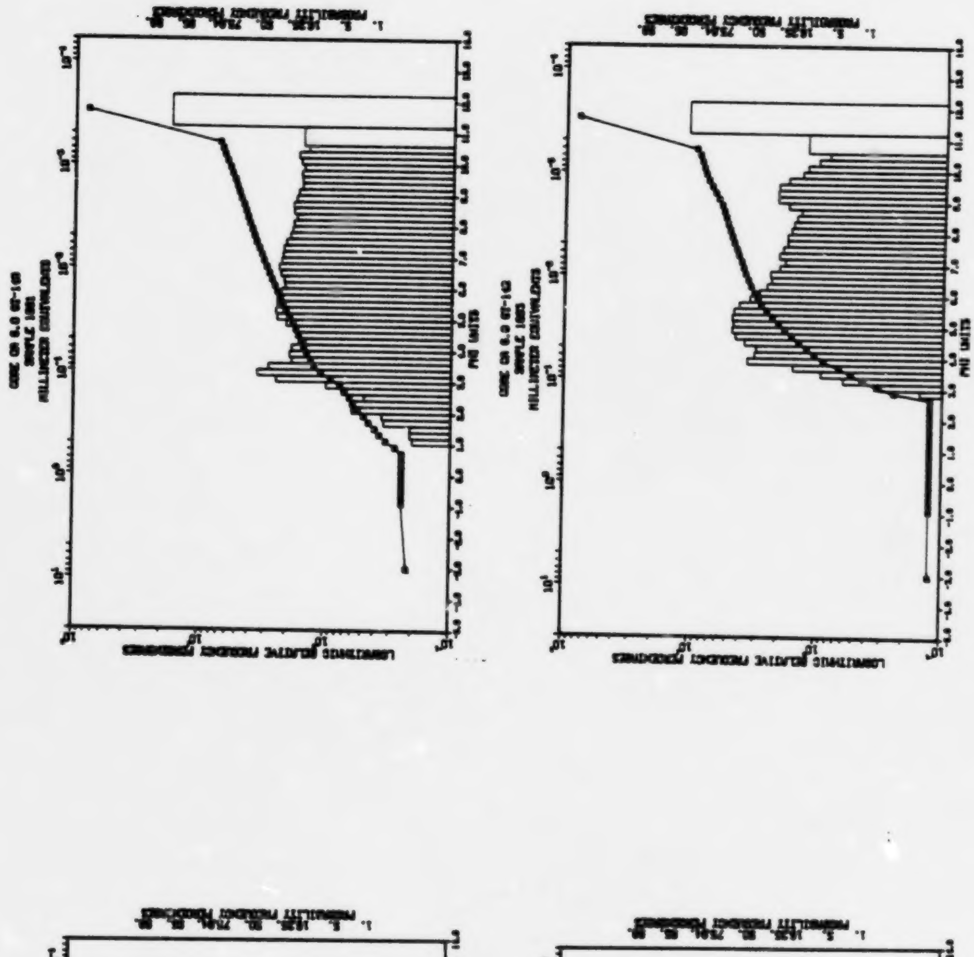


Fig. 11-19.

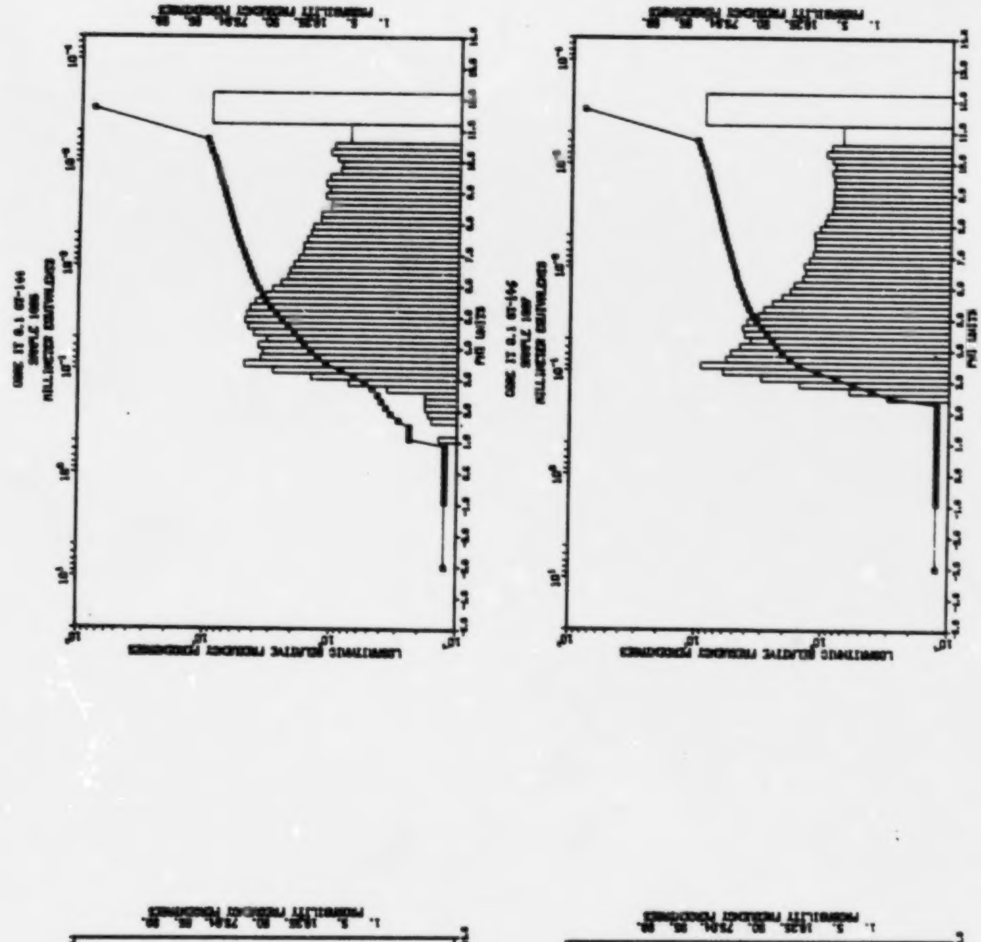
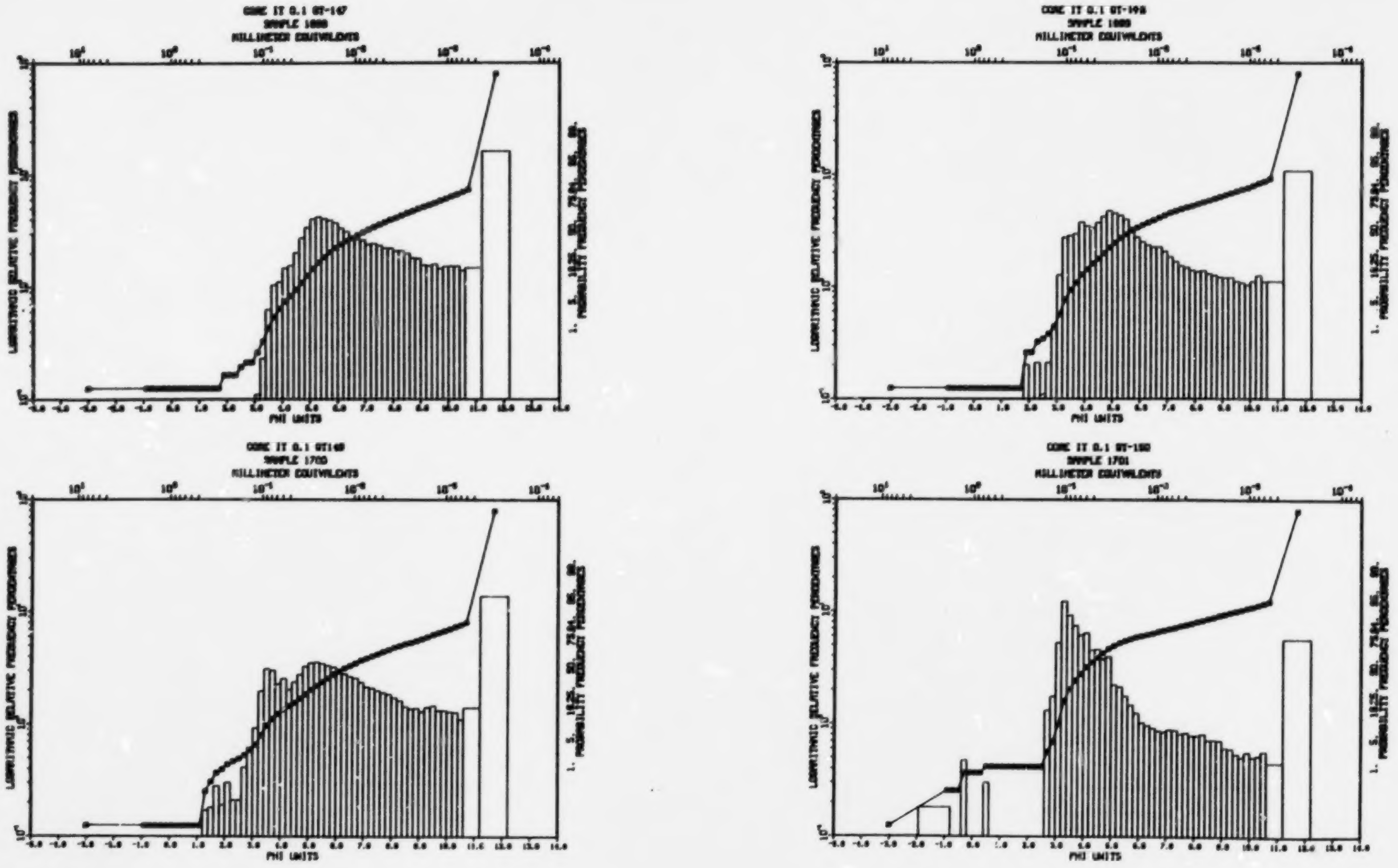


Fig. 11-20.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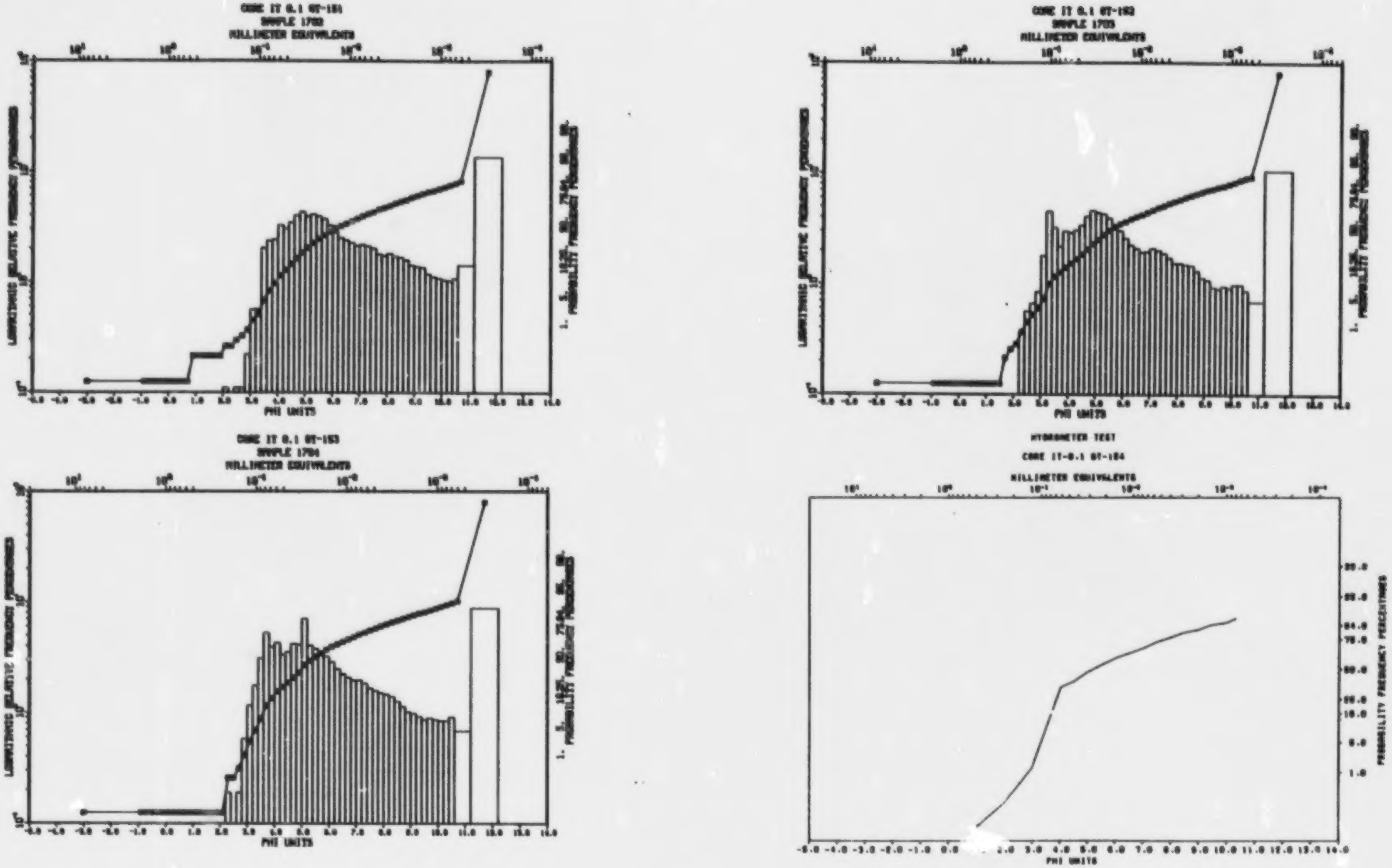
SAMPLE 1698
MILLIMETER EQUIVALENTS
CORE IT 0.1 GT-148
SAMPLE 1699
MILLIMETER EQUIVALENTS
CORE IT 0.1 GT149
SAMPLE 1700
MILLIMETER EQUIVALENTS
CORE IT 0.1 GT-150
SAMPLE 1701
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1. 5. 1025. 50. 7584. 95. 99.
PHI UNITS

Fig. 11-21.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SAMPLE 1702
MILLIMETER EQUIVALENTS
CORE IT 0.1 GT-152
SAMPLE 1703
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
CORE IT 0.1 GT-153
SAMPLE 1704
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE IT-0.1 GT-154
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-22.

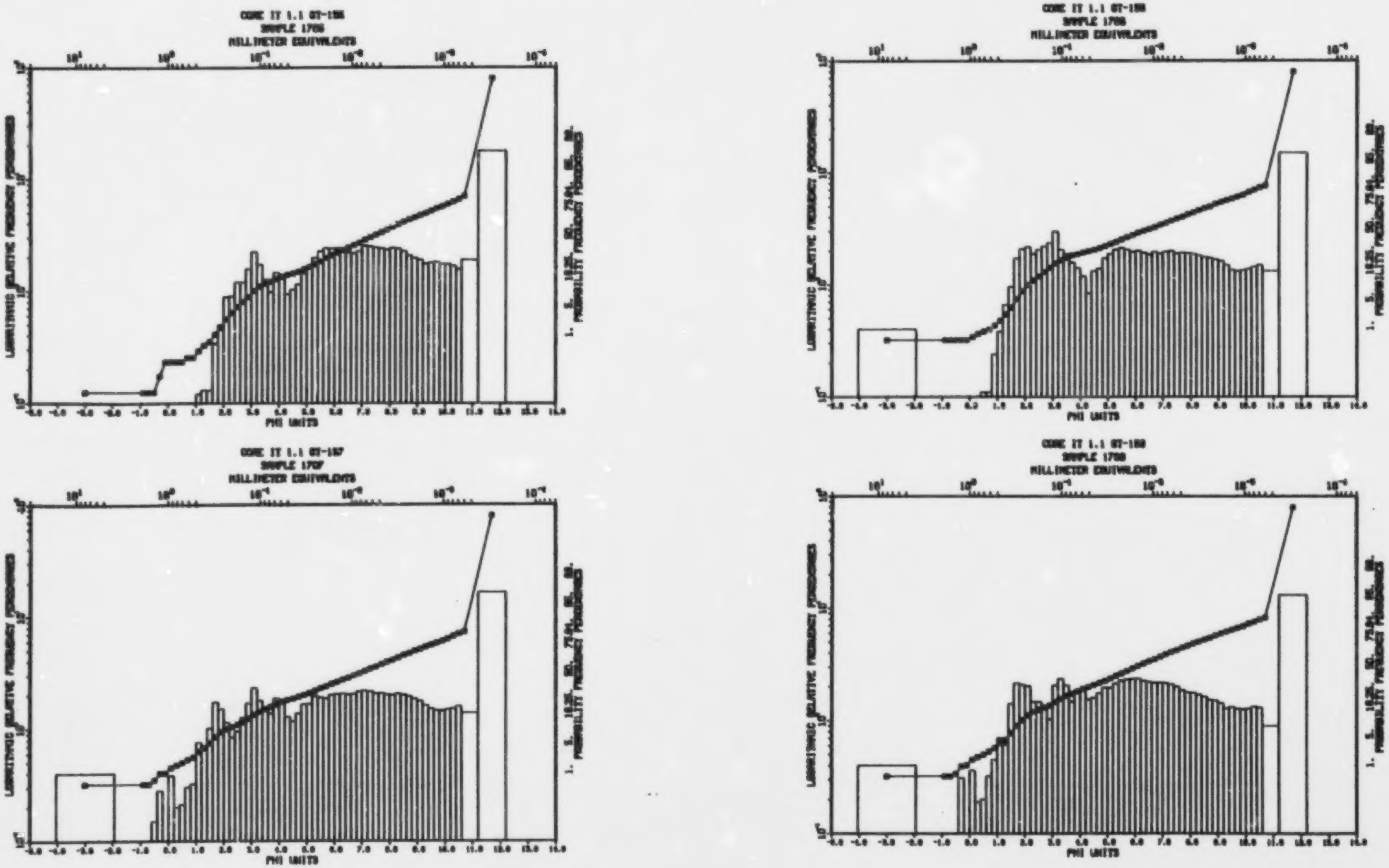
CORE IT 1.1 ST-155
SAMPLE 1705
MILLIMETER EQUIVALENTS
CORE IT 1.1 ST-156
SAMPLE 1706
MILLIMETER EQUIVALENTS
CORE IT 1.1 ST-157
SAMPLE 1707
MILLIMETER EQUIVALENTS
CORE IT 1.1 ST-158
SAMPLE 1708
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-23.

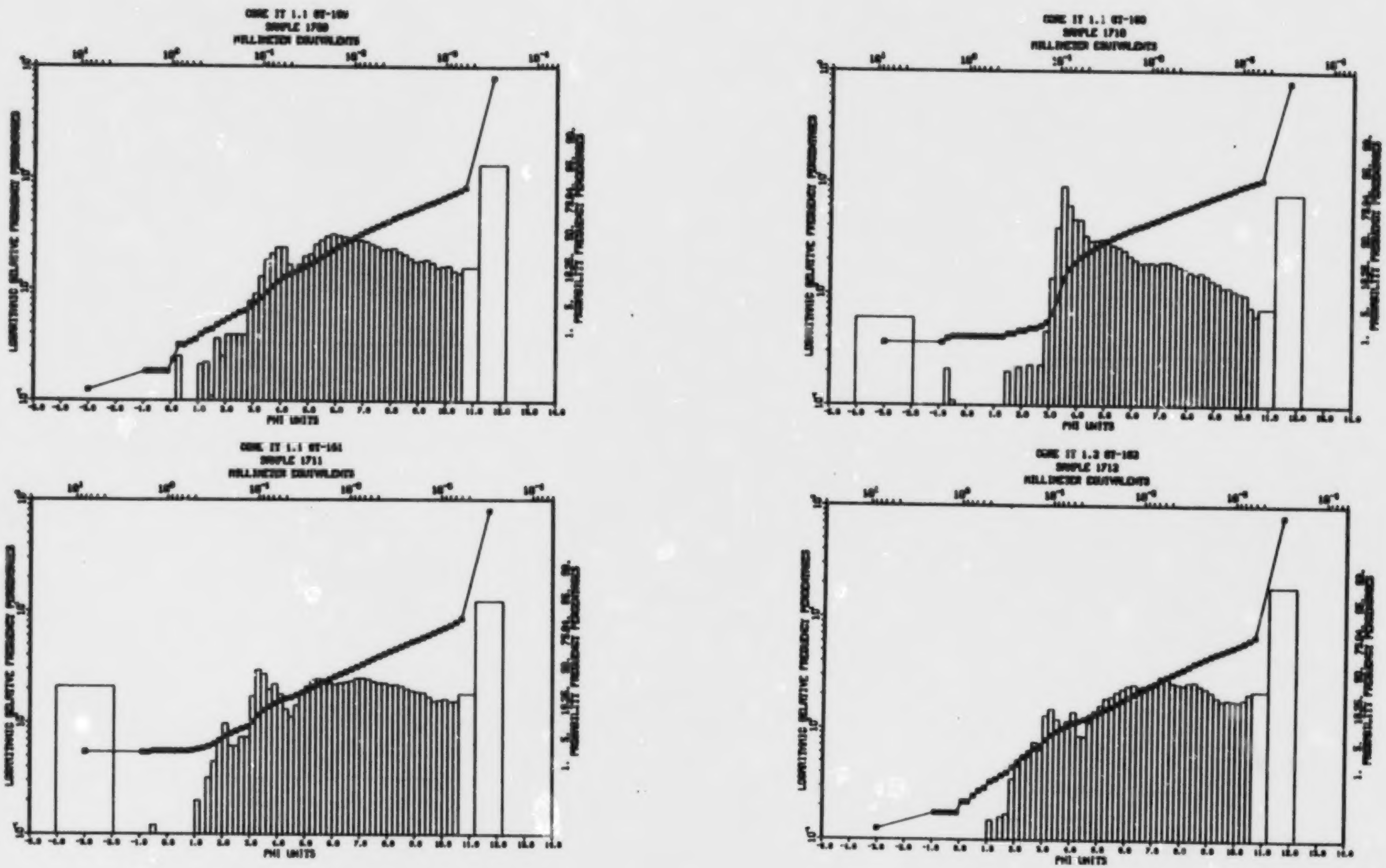
CORE IT 1.1 ST-159
SAMPLE 1709
MILLIMETER EQUIVALENTS
CORE IT 1.1 ST-160
SAMPLE 1710
MILLIMETER EQUIVALENTS
CORE IT 1.1 ST-161
SAMPLE 1711
MILLIMETER EQUIVALENTS
CORE IT 1.2 ST-162
SAMPLE 1712
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-24.

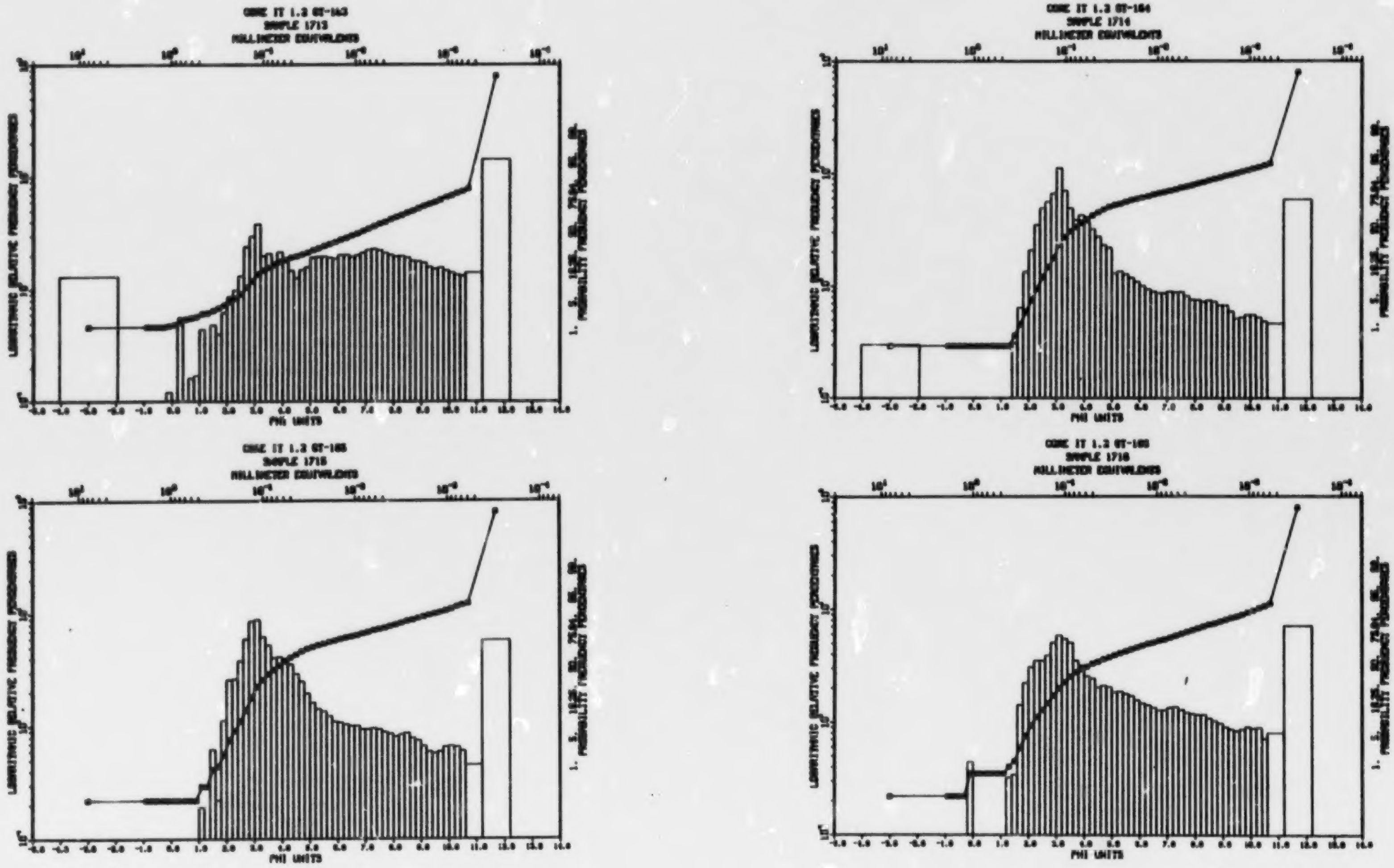
CORE IT 1.3 GT-143
SAMPLE 1713
MILLIMETER EQUIVALENTS
CORE IT 1.3 GT-144
SAMPLE 1714
MILLIMETER EQUIVALENTS
CORE IT 1.3 GT-145
SAMPLE 1715
MILLIMETER EQUIVALENTS
CORE IT 1.3 GT-146
SAMPLE 1716
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-25.

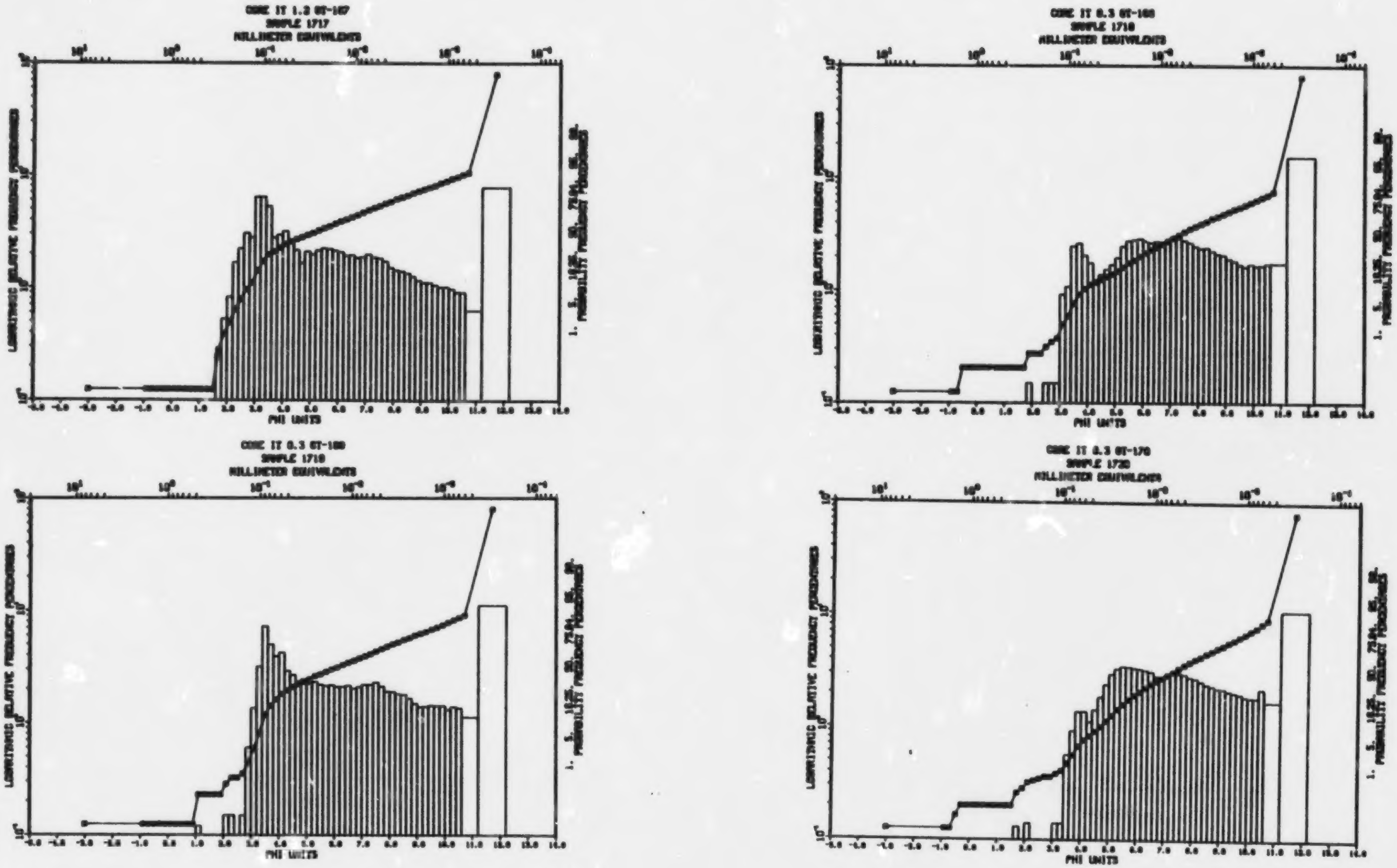
CORE II 1.2 67-167
SAMPLE 1717
MILLIMETER EQUIVALENTS
CORE II 0.3 67-168
SAMPLE 1718
MILLIMETER EQUIVALENTS
CORE II 0.3 67-169
SAMPLE 1719
MILLIMETER EQUIVALENTS
CORE II 0.3 67-170
SAMPLE 1720
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-26.

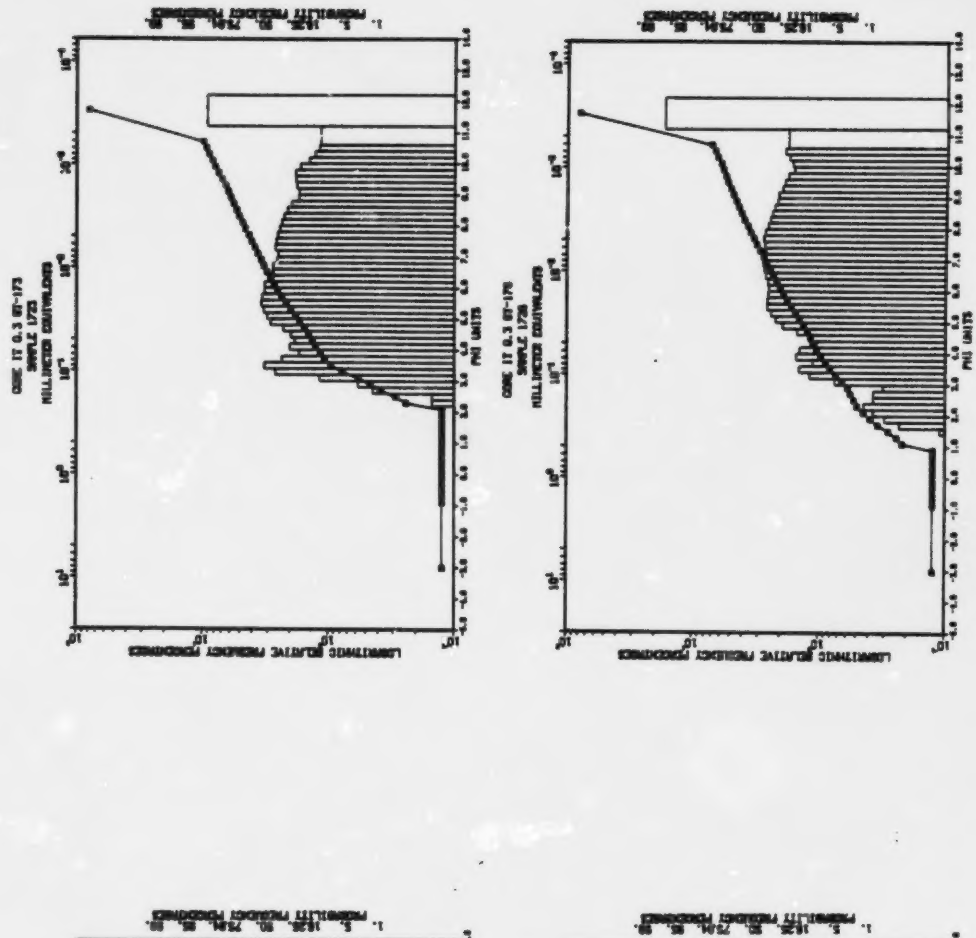
CORE II 0.3 GT-173
SAMPLE 1723
MILLIMETER EQUIVALENTS
CORE II 0.3 GT-176
SAMPLE 1726
MILLIMETER EQUIVALENTS
CORE II 0.3 GT-171
SAMPLE 1721
MILLIMETER EQUIVALENTS
CORE II 0.3 GT-174
SAMPLE 1724
MILLIMETER EQUIVALENTS
PHI UNITS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES

Fig. 11-27.

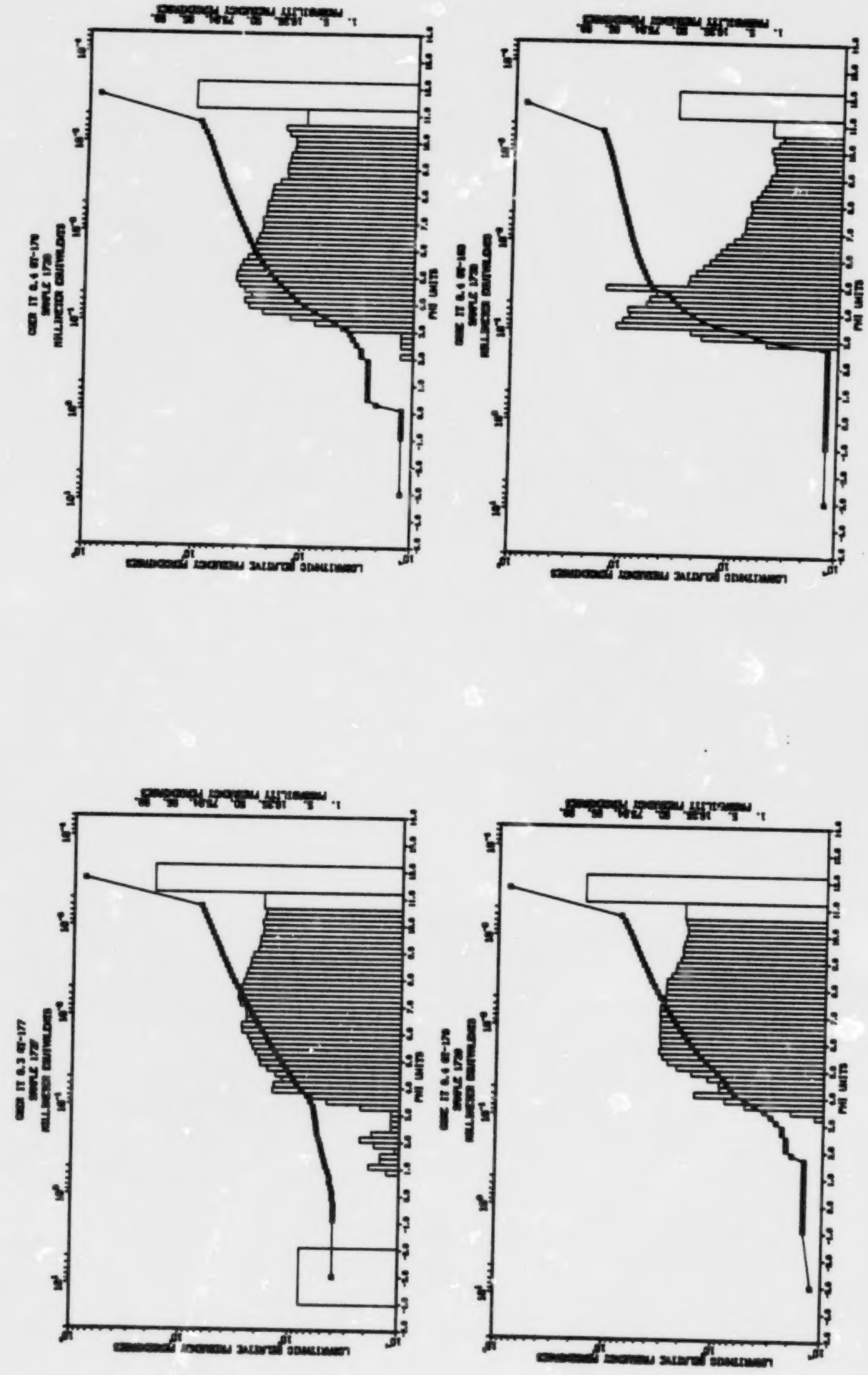

Fig. 11-28.

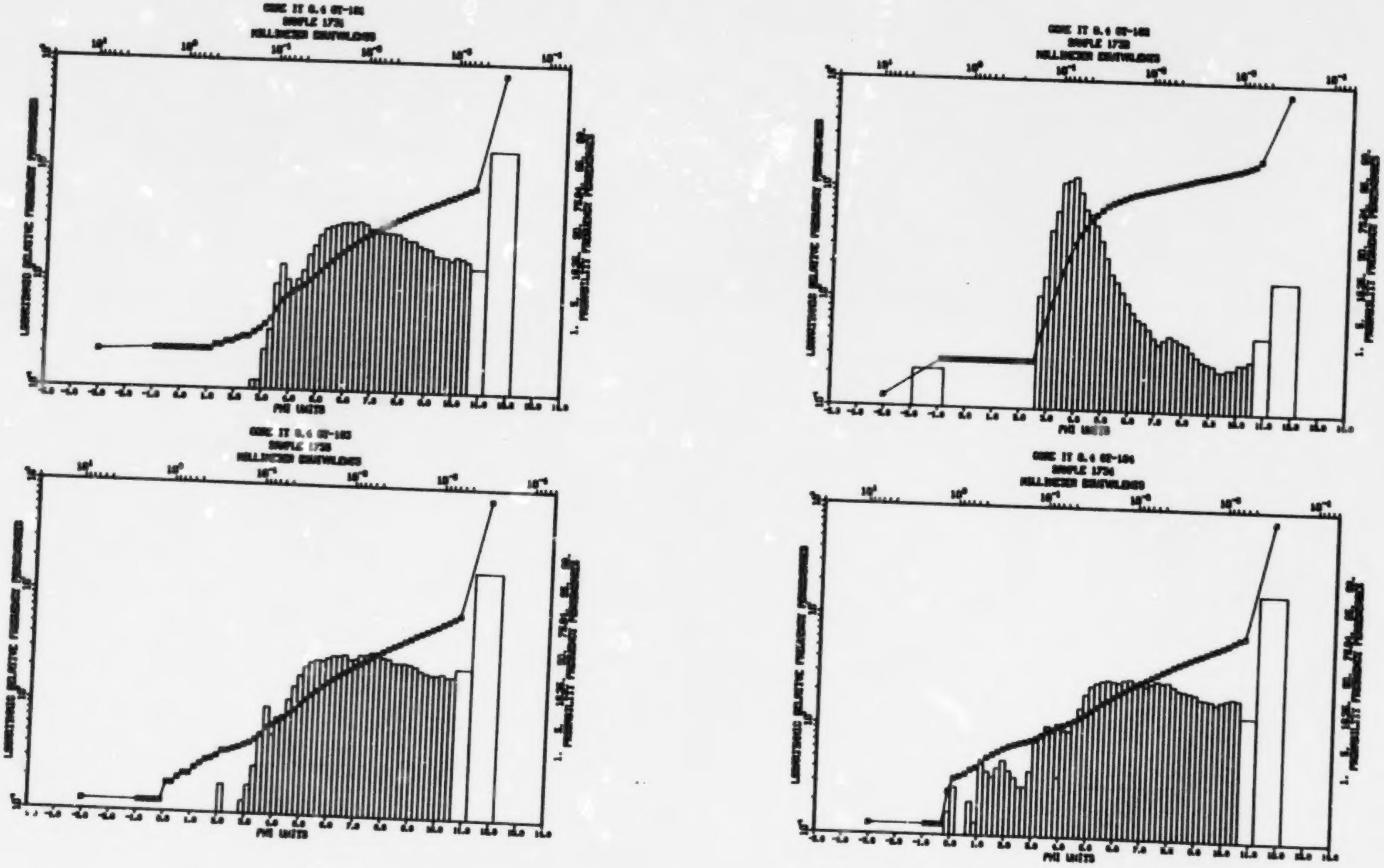

Fig. 11-29.

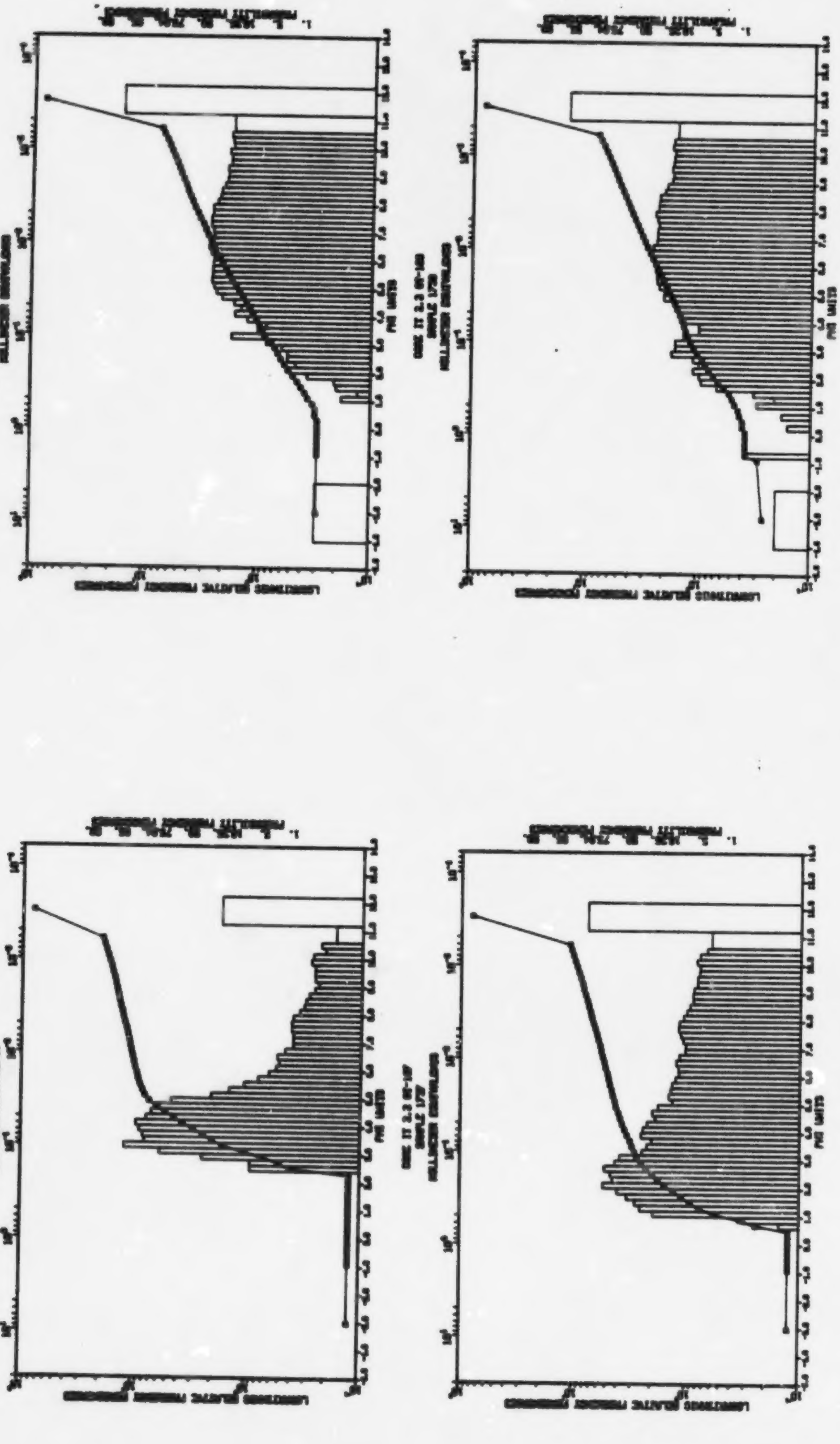

Fig. 11-30.

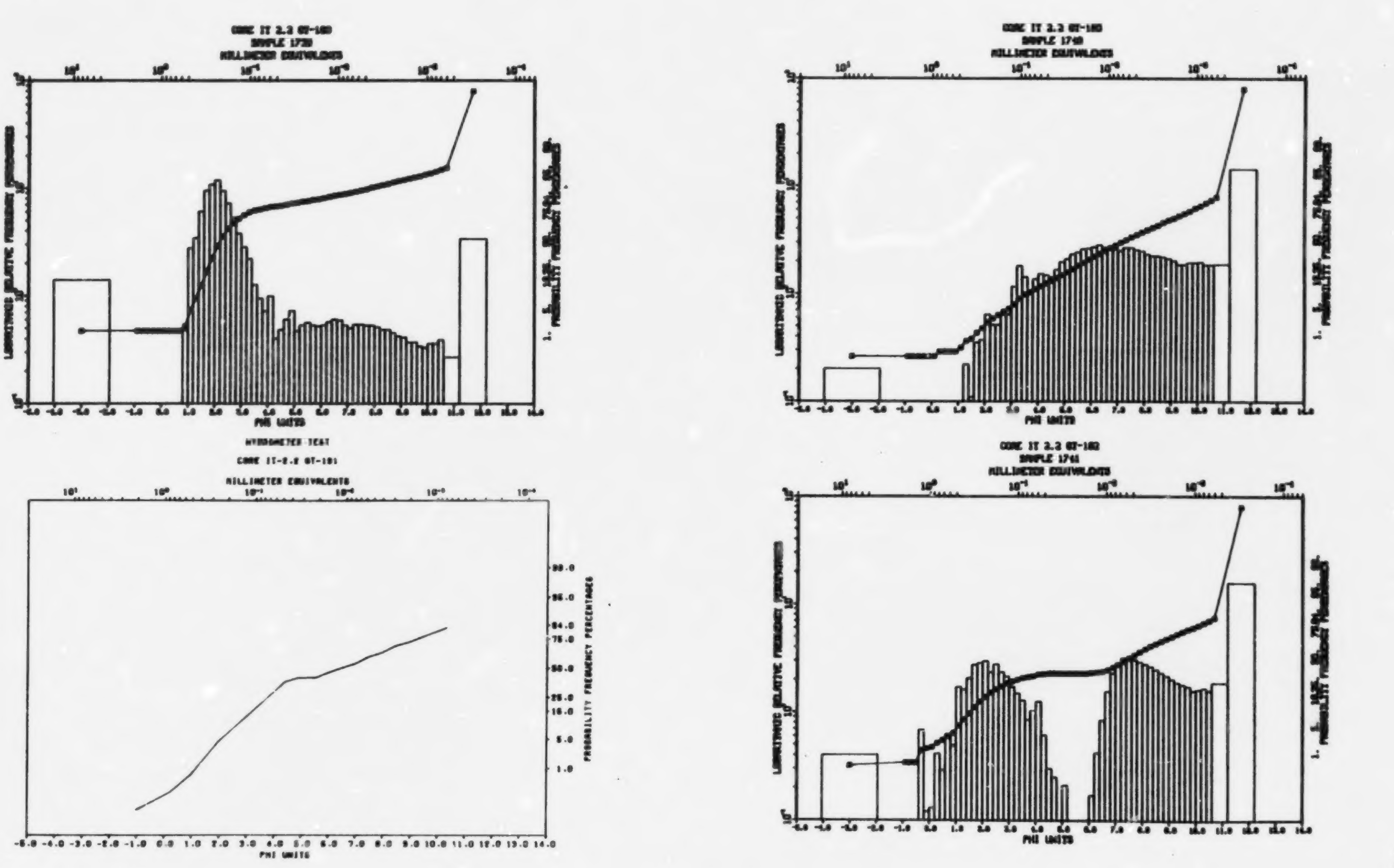
CORE IT 2.2 GT-180
SAMPLE 1739
MILLIMETER EQUIVALENTS
CORE IT 2.2 GT-180
SAMPLE 1740
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
HYDROMETER TEST
CORE IT-2.2 GT-181
MILLIMETER EQUIVALENTS
CORE IT 2.2 GT-182
SAMPLE 1741
MILLIMETER EQUIVALENTS
99.0
95.0
84.0
75.0
50.0
25.0
16.0
5.0
1.0
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0

Fig. 11-31.

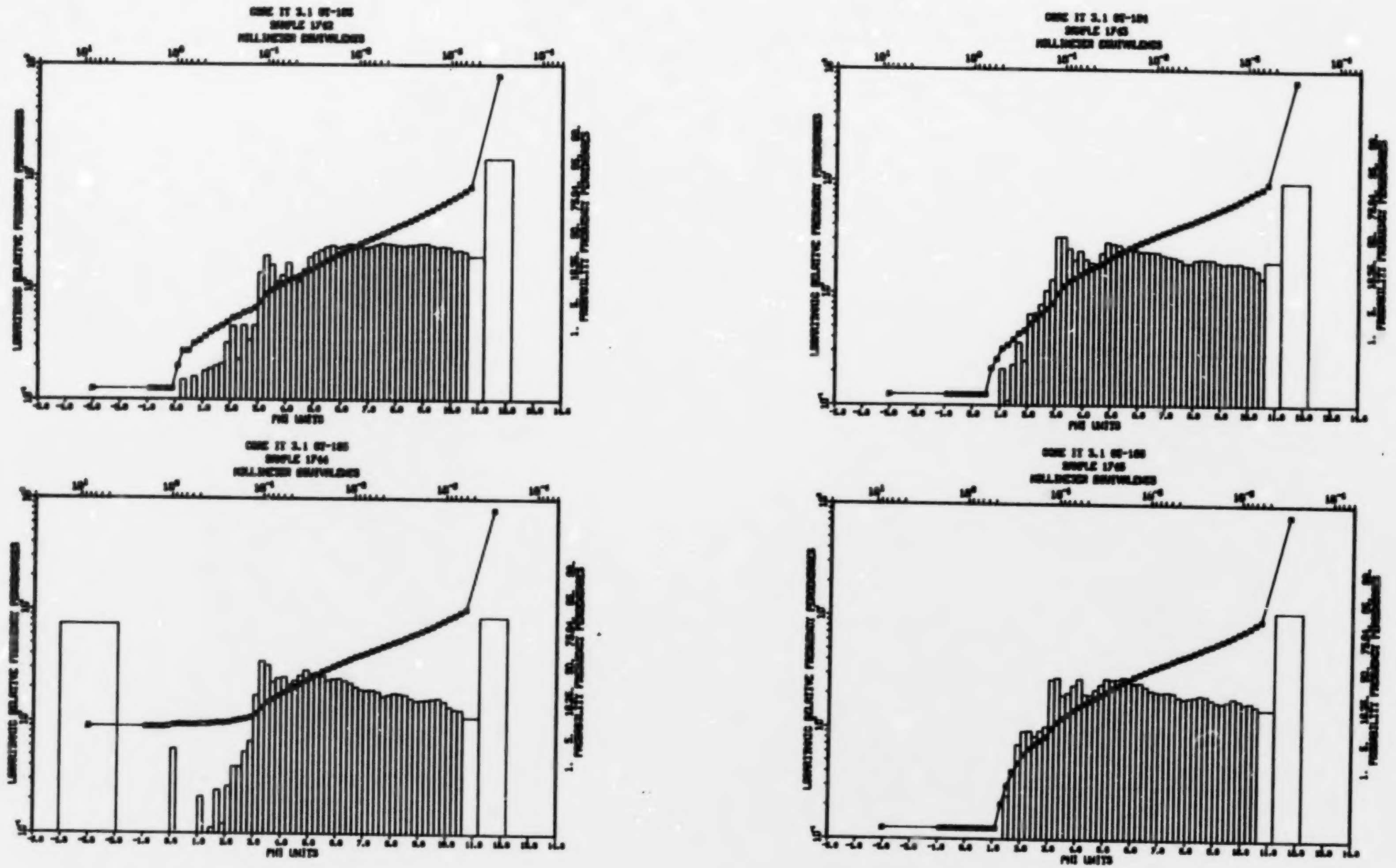
SAMPLE 1742
SAMPLE 1743
SAMPLE 1744
SAMPLE 1745
MILLIMETER EQUIVALENTS
PHI UNITS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES

Fig. 11-32.

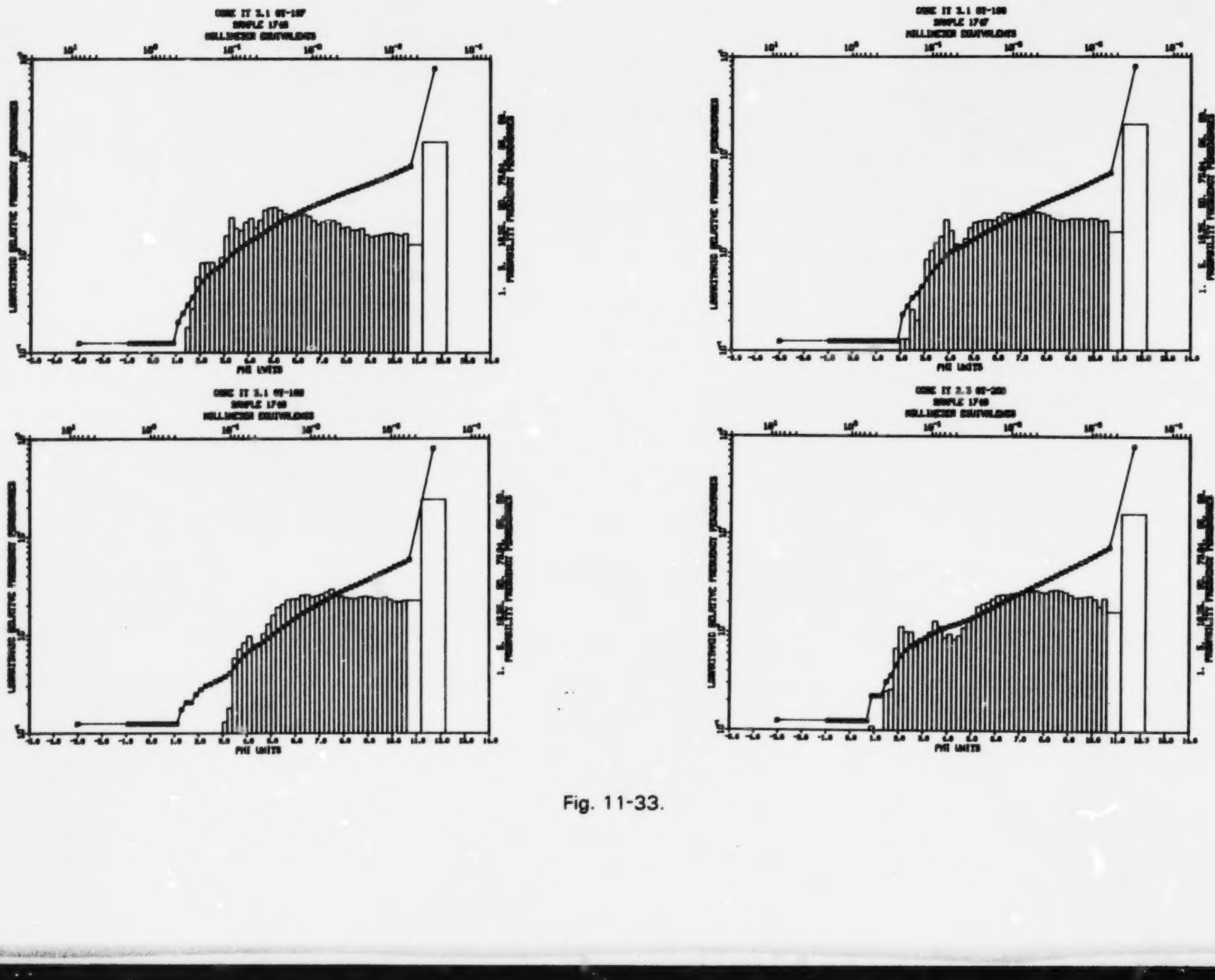
CORE IT 3.1 97-107
SAMPLE 1746
MILLIMETER EQUIVALENTS
CORE IT 3.1 97-108
SAMPLE 1747
MILLIMETER EQUIVALENTS
CORE IT 3.1 97-108
SAMPLE 1748
MILLIMETER EQUIVALENTS
CORE IT 2.3 98-200
SAMPLE 1749
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-33.

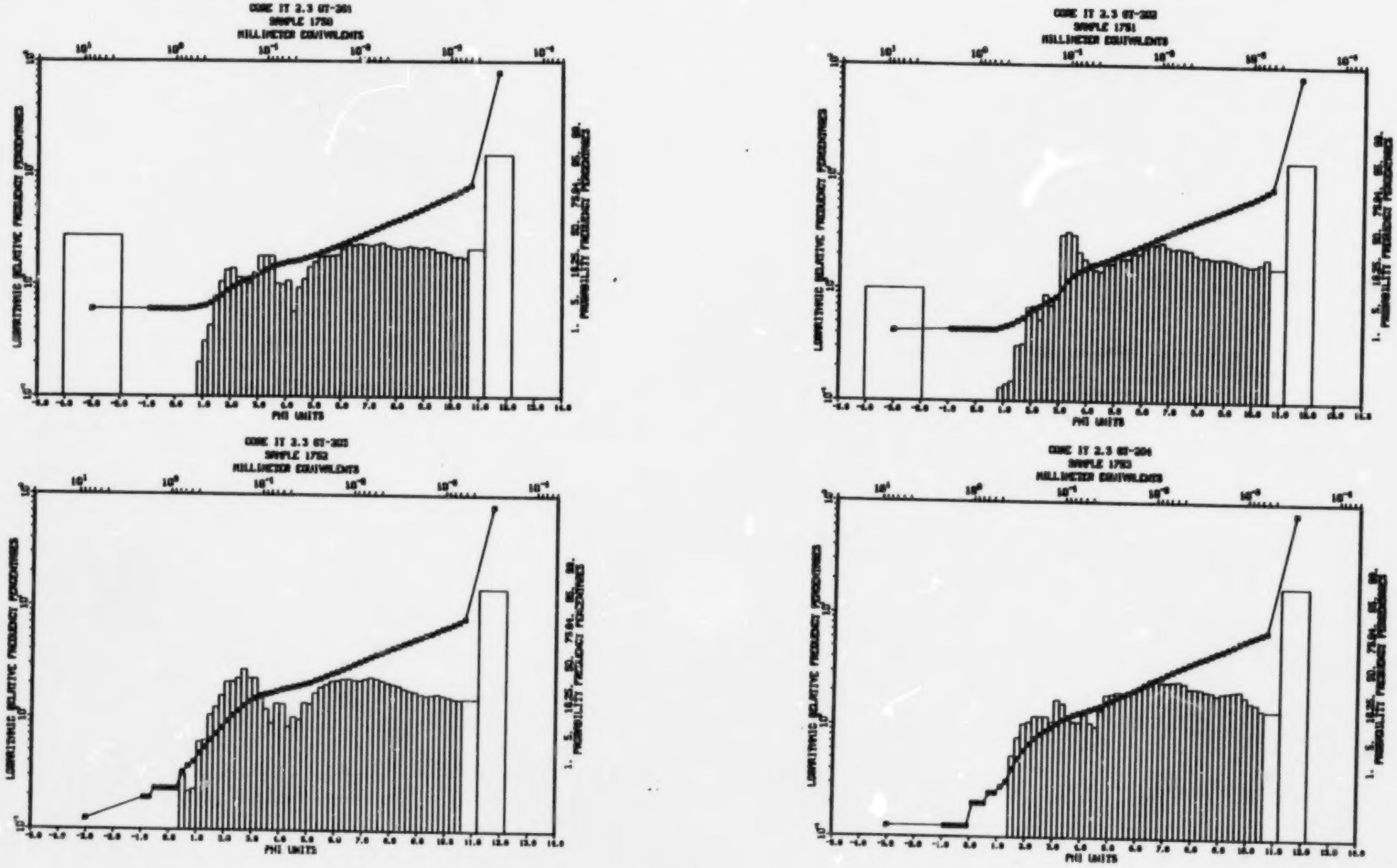
CORE IT 2.3 GT-201
SAMPLE 1750
MILLIMETER EQUIVALENTS
CORE IT 2.3 GT-202
SAMPLE 1751
MILLIMETER EQUIVALENTS
CORE IT 2.3 GT-203
SAMPLE 1752
MILLIMETER EQUIVALENTS
CORE IT 2.3 GT-204
SAMPLE 1753
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-34.

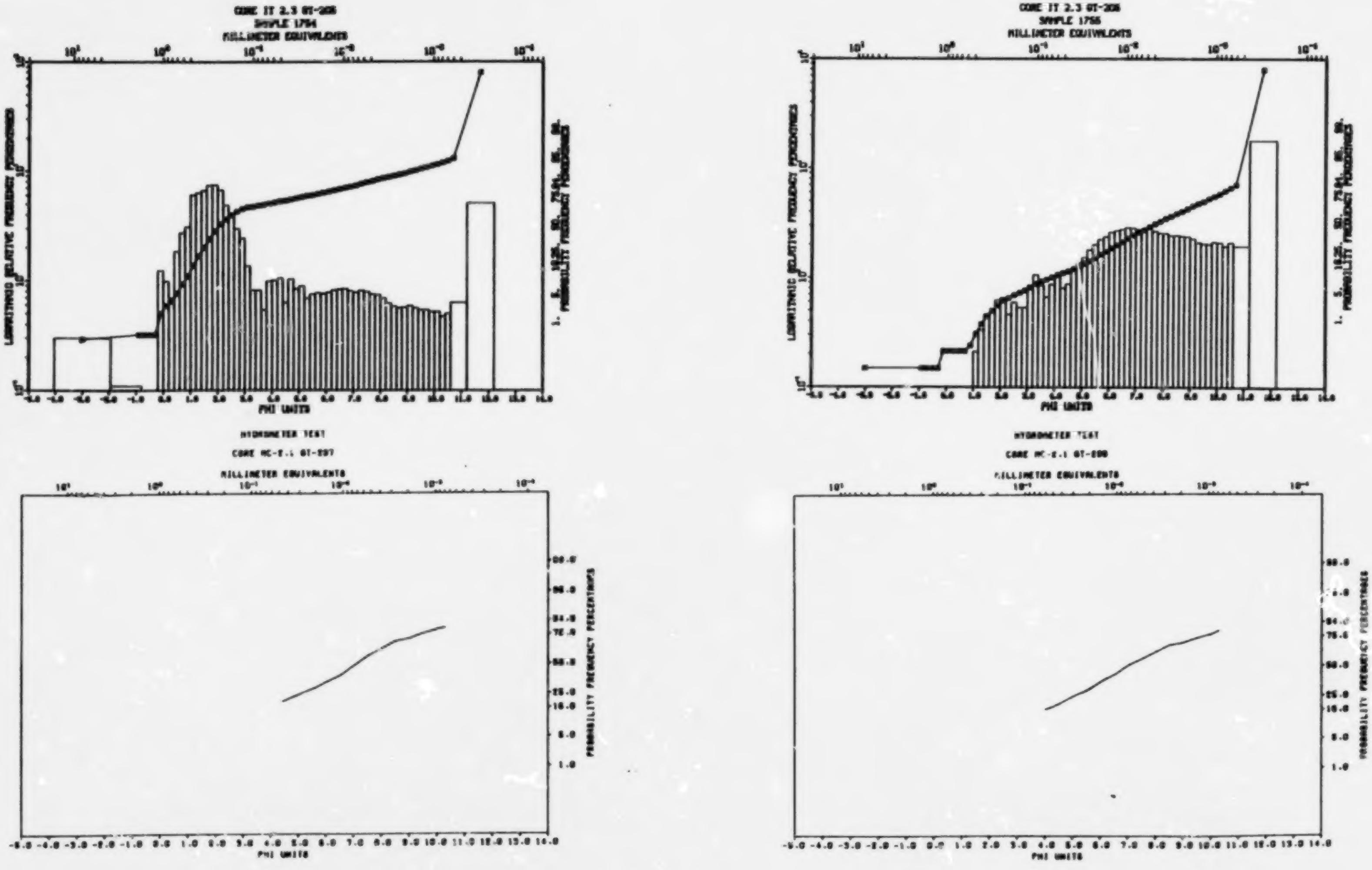
CORE IT 2.3 GT-206
SAMPLE 1754
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
CORE IT 2.3 GT-206
SAMPLE 1755
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
HYDROMETER TEST
CORE MC-2.1 GT-207
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
HYDROMETER TEST
CORE MC-2.1 GT-208
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-35.

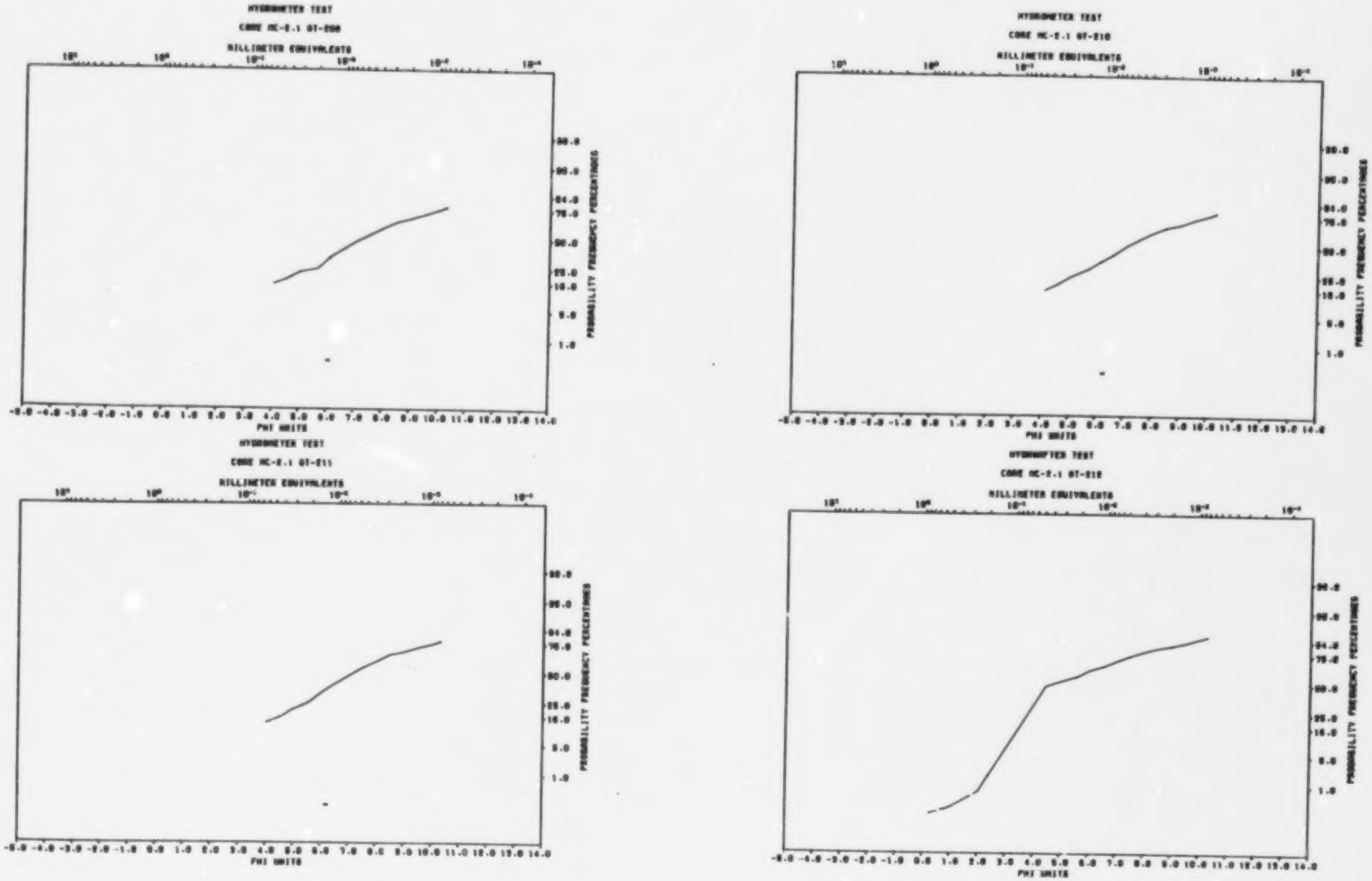
HYDROMETER TEST
CORE MC-2.1 GT-209
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE MC-2.1 GT-210
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE MC-2.1 GT-211
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE MC-2.1 GT-212
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
99.0
95.0
84.0
75.0
50.0
25.0
16.0
5.0
1.0
PROBABILITY FREQUENCY PERCENTAGES
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0
PHI UNITS

Fig. 11-36.

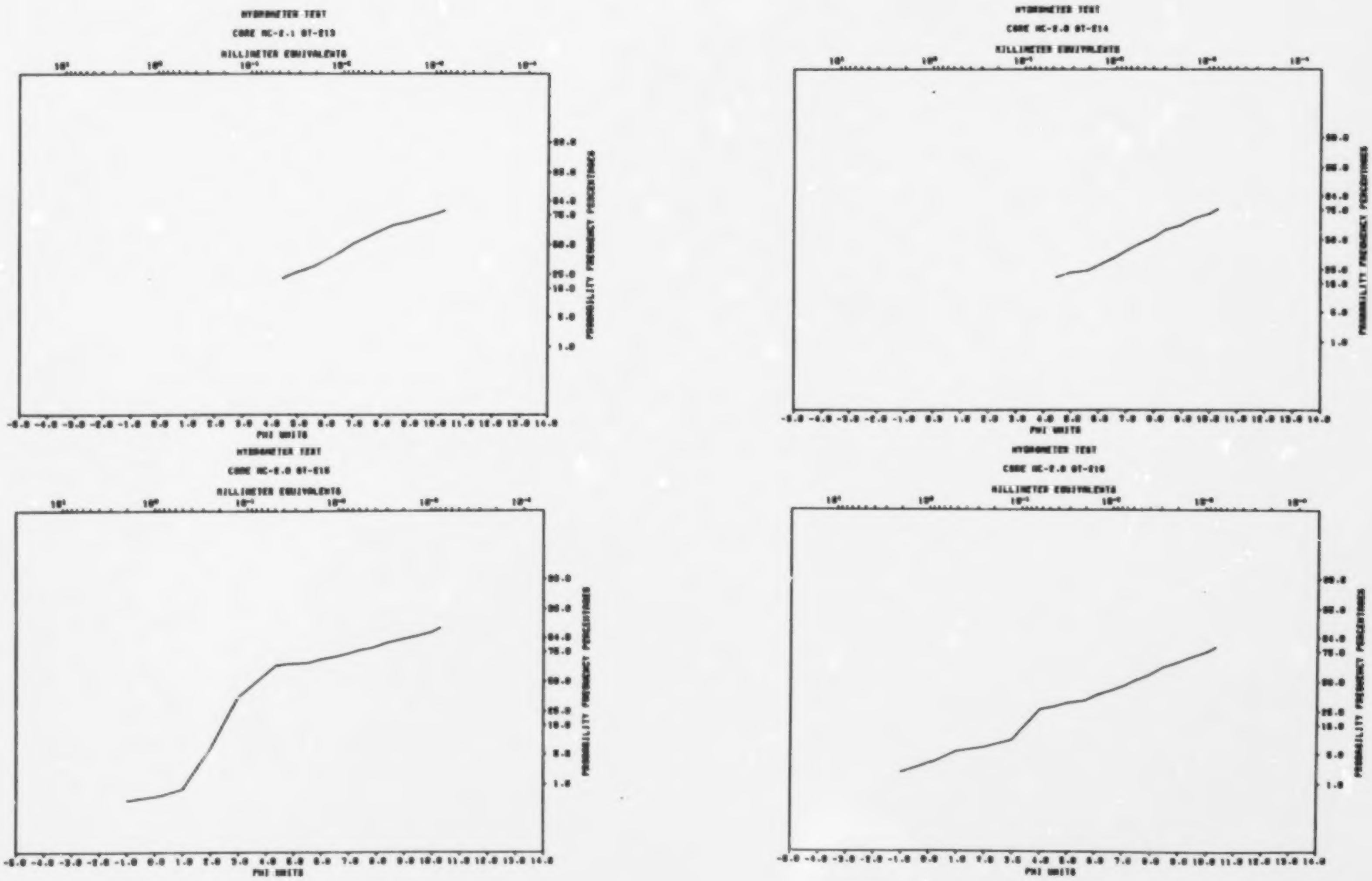
HYDROMETER TEST
CORE HC-2.1 GT-213
MILLIMETER EQUIVALENTS
10^{1} 10^{0} 10^{-1} 10^{-2} 10^{-3} 10^{-4}
99.0 95.0 84.0 75.0 50.0 25.0 16.0 5.0 1.0
PROBABILITY FREQUENCY PERCENTAGES
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0
PHI UNITS
HYDROMETER TEST
CORE HC-2.0 GT-214
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
HYDROMETER TEST
CORE HC-2.0 GT-215
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
HYDROMETER TEST
CORE HC-2.0 GT-216
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-37.

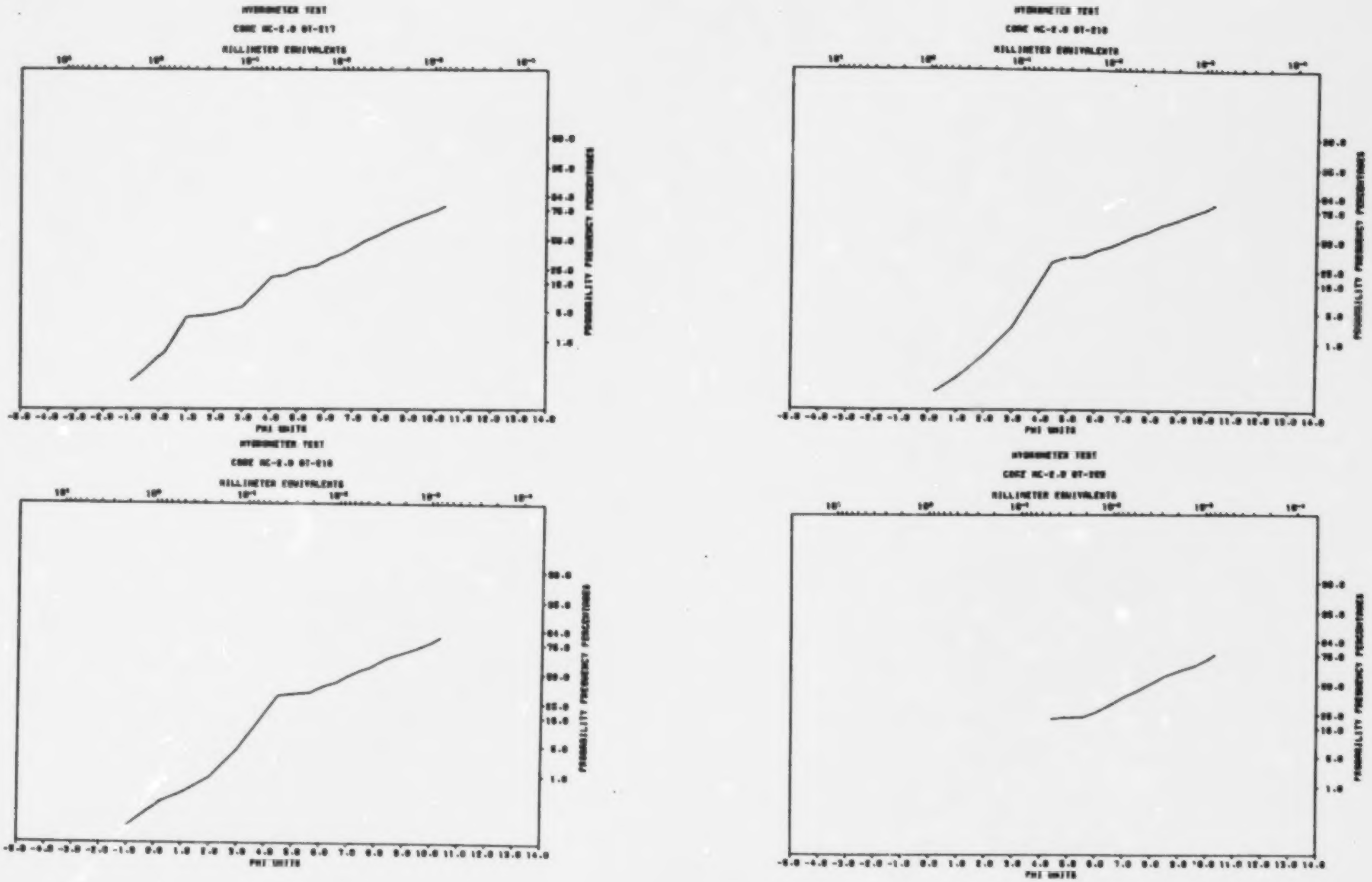HYDROMETER TEST
CORE HC-2.0 BT-217
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE HC-2.0 BT-218
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE HC-2.0 BT-216
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE HC-2.0 BT-209
MILLIMETER EQUIVALENTS
10^1 10^0 10^{-1} 10^{-2} 10^{-3} 10^{-4}
PROBABILITY FREQUENCY PERCENTAGES
99.0
95.0
84.0
75.0
50.0
25.0
16.0
5.0
1.0
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0
PHI UNITS

Fig. 11-38.

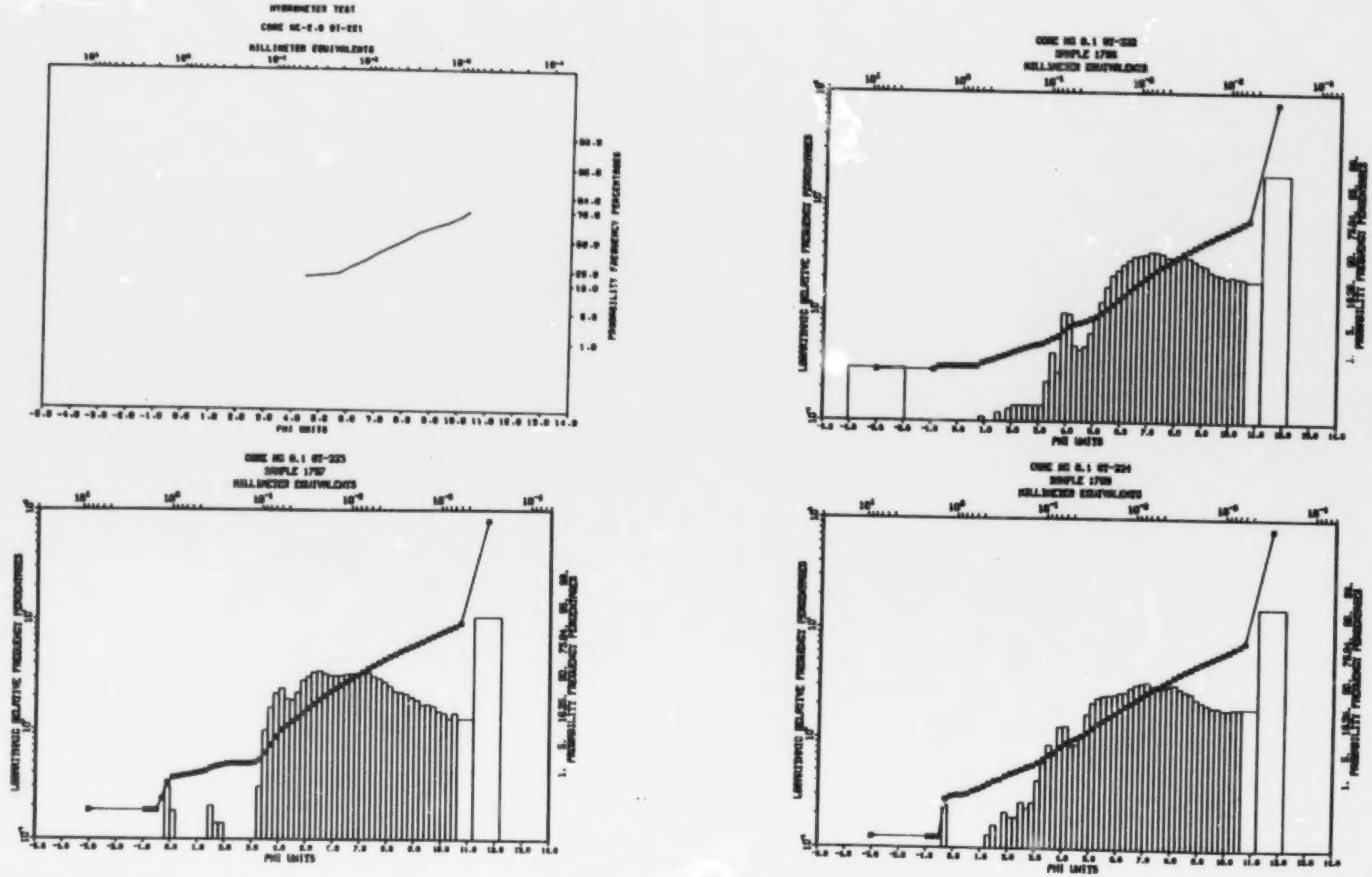
HYDROMETER TEST
CORE NC-2.0 07-221
MILLIMETER EQUIVALENTS
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
CORE NO 0.1 07-222
SAMPLE 1786
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
CORE NO 0.1 07-223
SAMPLE 1787
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS
CORE NO 0.1 07-224
SAMPLE 1789
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11.39.

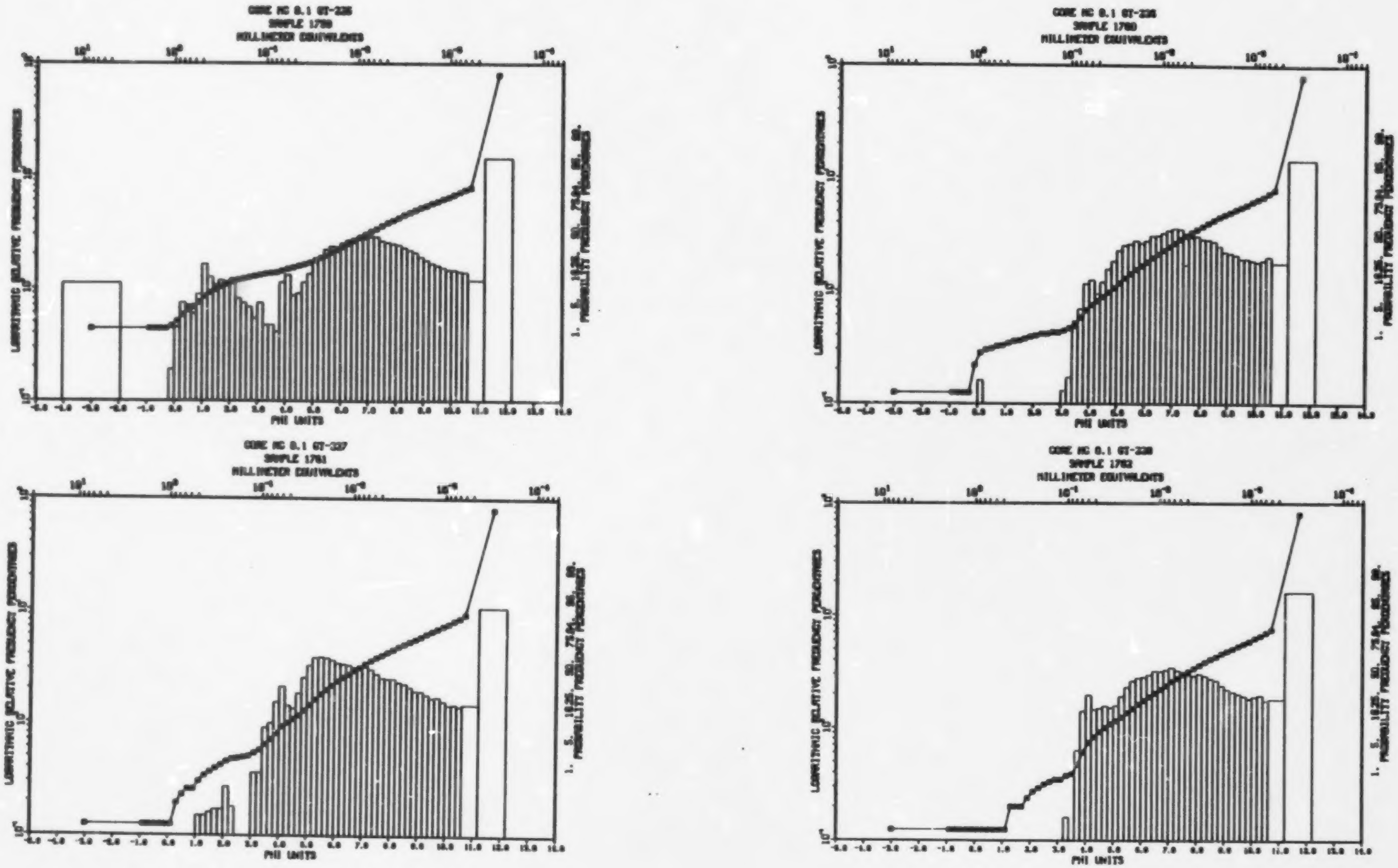
CORE NC 8.1 GT-235
SAMPLE 1759
MILLIMETER EQUIVALENTS
CORE NC 8.1 GT-236
SAMPLE 1760
MILLIMETER EQUIVALENTS
CORE NC 8.1 GT-237
SAMPLE 1761
MILLIMETER EQUIVALENTS
CORE NC 8.1 GT-238
SAMPLE 1762
MILLIMETER EQUIVALENTS
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
PHI UNITS

Fig. 11-40.

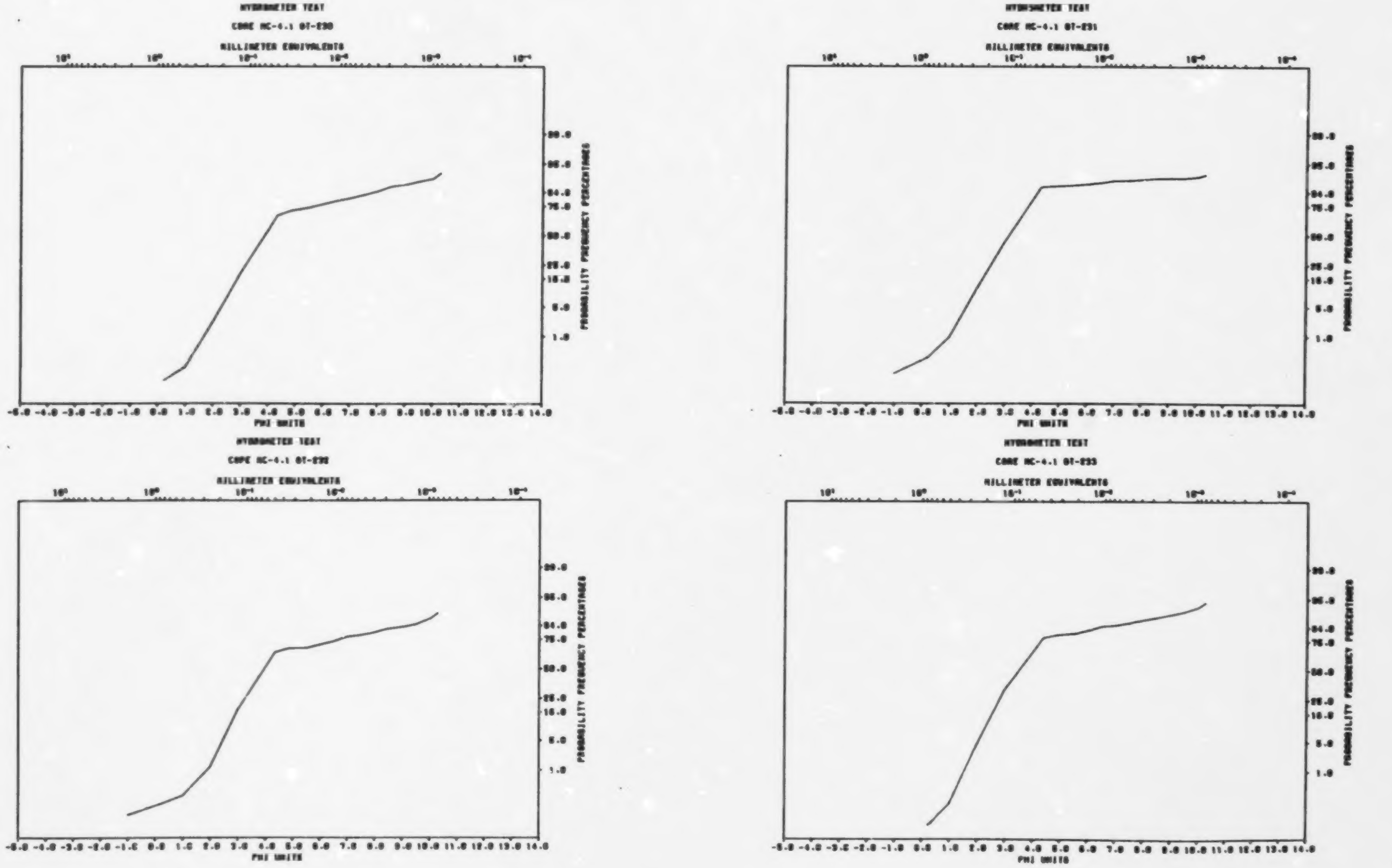
HYDROMETER TEST
CORE NC-4.1 BT-230
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE NC-4.1 BT-231
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE NC-4.1 BT-232
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE NC-4.1 BT-233
MILLIMETER EQUIVALENTS
10^1 10^0 10^{-1} 10^{-2} 10^{-3} 10^{-4}
99.0 95.0 84.0 75.0 50.0 25.0 16.0 5.0 1.0
PROBABILITY FREQUENCY PERCENTAGES
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0
PHI UNITS

Fig. 11-41.

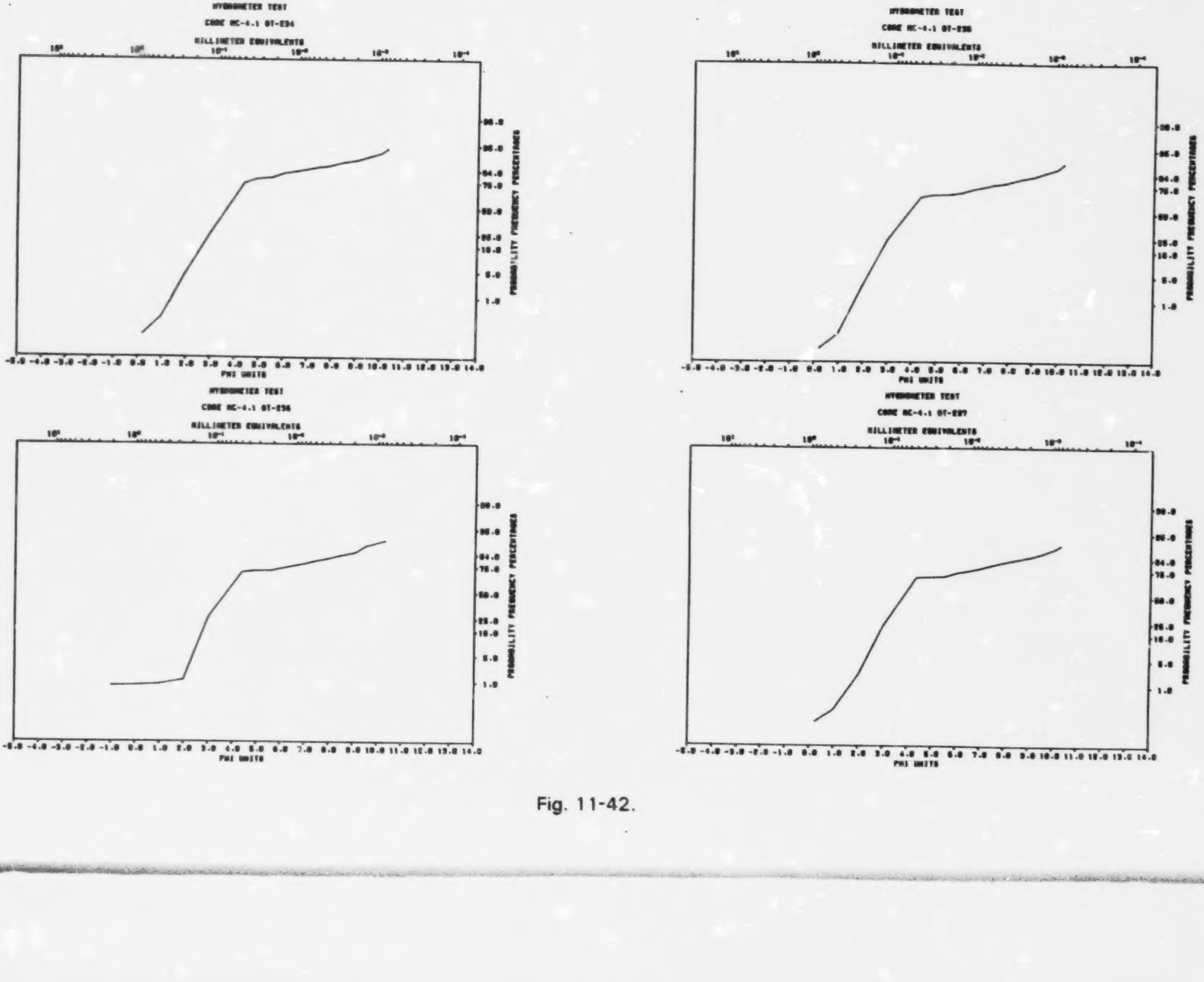
HYDROMETER TEST
CORE RC-4.1 GT-234
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
99.0
95.0
84.0
75.0
50.0
25.0
16.0
5.0
1.0
PROBABILITY FREQUENCY PERCENTAGES
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0
PHI UNITS
HYDROMETER TEST
CORE RC-4.1 GT-235
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE RC-4.1 GT-236
MILLIMETER EQUIVALENTS
HYDROMETER TEST
CORE RC-4.1 GT-237
MILLIMETER EQUIVALENTS

Fig. 11-42.

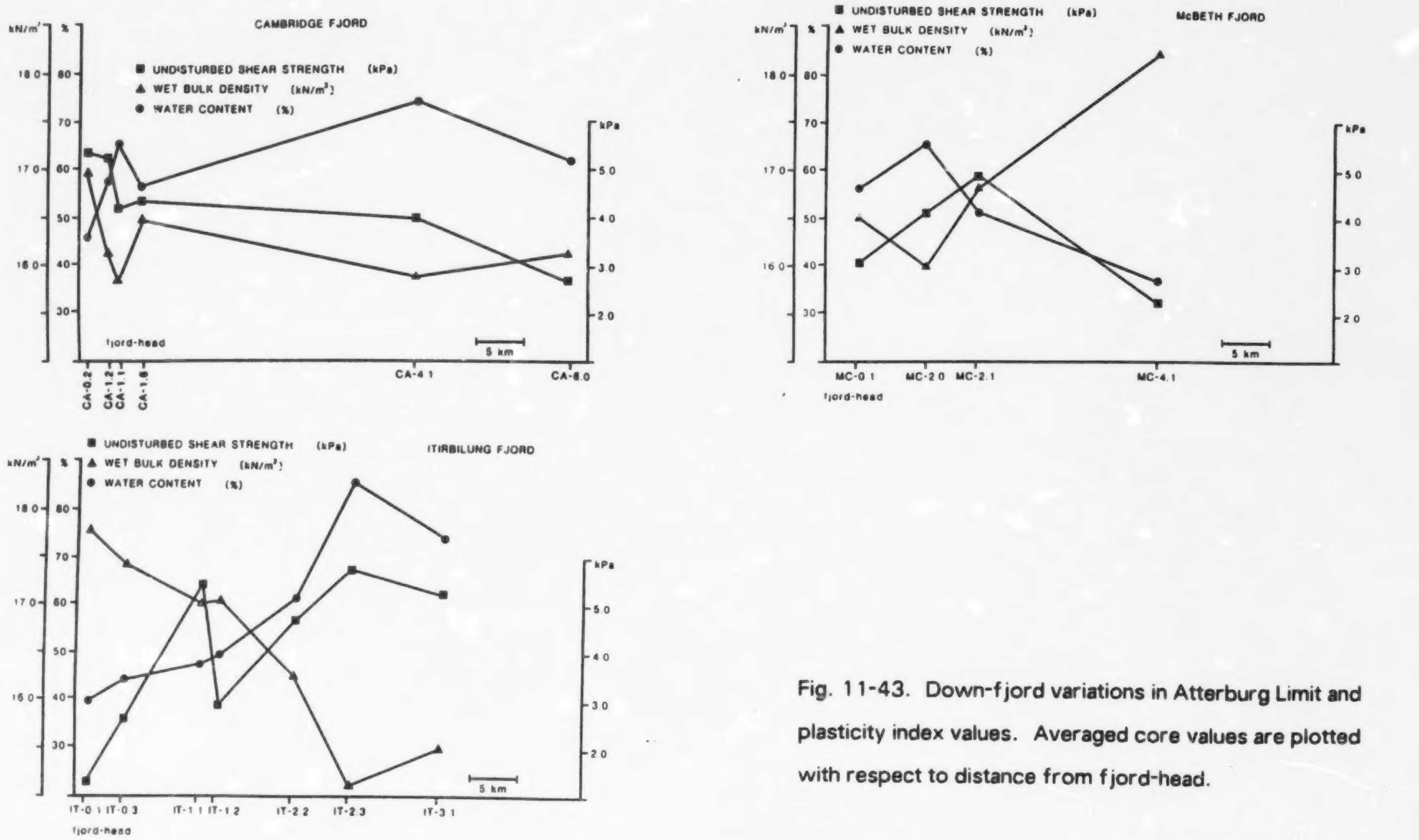

Fig. 11-43. Down-fjord variations in Atterburg Limit and plasticity index values. Averaged core values are plotted with respect to distance from fjord-head.

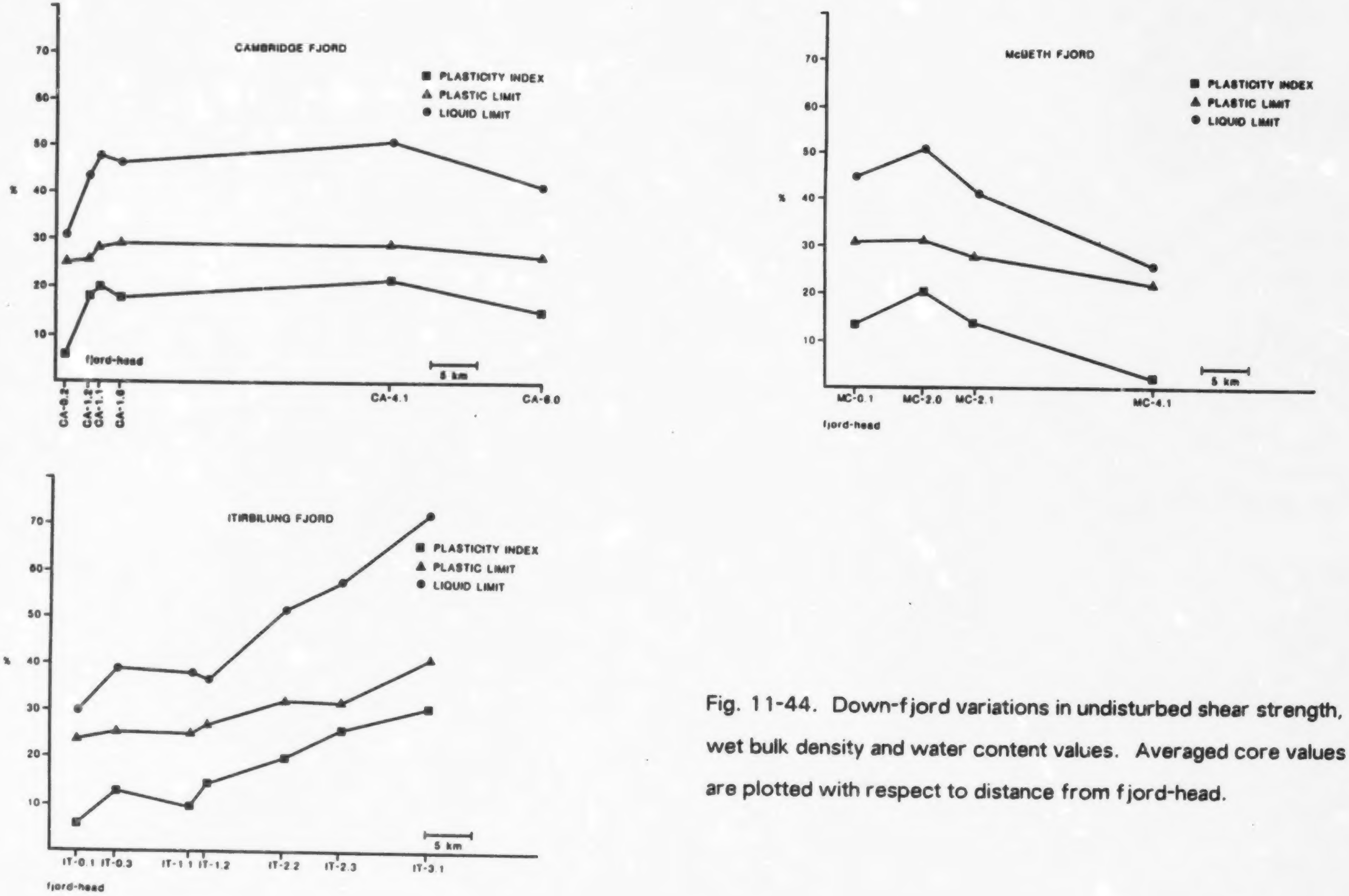

Fig. 11-44. Down-fjord variations in undisturbed shear strength, wet bulk density and water content values. Averaged core values are plotted with respect to distance from fjord-head.

6. REFERENCES CITED

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7. APPENDIX 1. CORE DESCRIPTIONS: SHIPBOARD LOG

Cambridge Fjord: Core CA-0.2, Core length=20.5 cm, 83-18110.

Poor recovery

0-2.5 cm: 5y 4/2; Olive gray soupy mud with large (5 x 3 cm and 3 x 3 cm), sub-angular granitic clasts. The large clasts are partially embedded in the upper 2 to 3 cm of firm underlying mud. Surfaces of clasts exposed above the lower mud display epifauna (forams). Clast surfaces do not appear to protrude above the upper surface of the overlying soupy mud.

2.5-20.5 cm: 5y 4/1; Dark gray structureless mud. Polycheate burrows (2 to 4 mm daimeter) are dispersed throughout in random orientation. Live polycheate worm found in burrow at 4 cm. Fibrous black organic material at 20.5 cm.

DISTURBANCE: Upper 3 cm, flow during split.

Cambridge Fjord: Core CA-1.1, Core length=217 cm, 83-18119.

General: Homogeneous, structureless, massive mud.

0-3 cm: 5y 4/2; Olive gray soupy mud. Oxidized cap. Disturbed.

3-22 cm: 5y 4/1; Dark gray mottled black mud. Scattered burrows dispersed throughout in random orientation. Poorly defined black reduced patches dispersed throughout. Dark reduced patches are elongate and vary in size (up to 1 cm long). Oxidized zone at 19 cm, 10yr 3/4, 1 cm thick, pinches out at core center. Dropstone at 20 cm, 1 x 1.5 cm.

22-25 cm: 5y 4/2; Olive gray, speckled black-pink-white, coarse sand to granule bed. Unit is 3 cm thick. Coarse unit is massive and shows sharp, irregular upper and basal contacts. Unit pinches out at core center.

25-217 cm: 5y 4/2; Olive gray, mottled, structureless mud. 2 to 3 mm diameter open burrows dispersed in random orientation throughout. Light to moderate burrowing above 112 cm, moderate to heavy burrowing below 112 cm. Dark reduced patches show vague horizontal orientation. Dark reduced patches (filled burrows) show better definition below 185 cm.

DISTURBANCE: Upper 3 cm, flow during split.

NOTES: When inserting water content subsampler at GT 125 (144 cm), water surfaced through open burrows 10 cm above and below subsample location. Shear testing at coarse sand to granule bed at 22 to 25 cm showed that coarse bed extends across core width below split surface. Angular, granitic clasts up to 2 x 2 cm present in unit. Remoulded shear test not possible.

Cambridge Fjord: Core CA-1.2, Core length=197 cm, 83-18117.

General: Homogeneous, structureless heavily burrowed mud.

0-4 cm: 5y 4/2; Olive gray, soupy mud. Oxidized cap. Disturbed. Two dropstones at 4 cm; angular, biotite, garnet amphibolite. Dropstones are approximately 2 x 4 cm and are partially embedded in the underlying firm mud. Upper surfaces are exposed in overlying soupy mud. Medium to coarse sand horizon also at 4 cm (contact between upper soupy and lower firm muds). Coarse sand horizon is somewhat disturbed and shows irregular upper and basal contacts. Two worm burrows .3 cm diameter and 4 cm in length also near contact. Burrow walls are cohesive (mucus cement) sandy mud and are approximately 2 mm thick.

4-75 cm: 5y 4/1; Dark gray mottled black mud. Open burrows dispersed throughout in random orientation. Light to moderate burrowing. Poorly defined black reduced patches also dispersed throughout. Reduced patches are commonly sub-horizontal streaks approximately 1 cm in length. Occasional larger patches up to 2 x 5 cm are in random orientation. Reduced patches do not appear to be associated with open burrows.

75-108 cm: 5y 4/1; Dark gray mottled black mud similar to overlying interval except that burrows are in higher concentration. Moderate to heavy burrowing.

108-110 cm: 5y 5/1; Dark gray speckled black, fine to medium massive sand. Sharp irregular basal contact. Upper contact appears gradational (poorly ddefined).

110-197 cm: 5y 4/1; Dark gray mottled black, structureless mud. Black reduced patches-streaks more abundant and show slight horizontal orientation. Moderate to heavy burrowing.

DISTURBANCE: Upper 4 cm, flow during split.

Cambridge Fjord: Core CA-1.6, Core length=138 cm, 83-18113.

0-3 cm; 5y 4/2; Olive gray soupy mud. Disturbed.

3-8 cm: 5y 3/1; Very dark gray mottled black mud. Irregular patches up to 1 x 5 cm of oxidation (2.5y 4/2). Oxidized zones are concentrated around burrows. Burrows are 2 to 4 mm in diameter.

8-32 cm: 5y 4/1; Dark gray mottled black mud. Irregular to elongate black reduced patches (filled burrows?) up to 1 cm in length dispersed throughout in random orientation. Two varities of open burrows are also present; 1.5-3 mm diameter and 3 to 5 mm diameter. Both are in random orientation. Interval is homogeneous and structureless with moderate to heavy burrowing.

32-59 cm: Same as above with dark reduced patches not as well defined.

59-62 cm: 5y 4/1; Dark gray speckled black (mafic grains) graded silt to fine sand bed. Normal grading. Sharp, irregular basal contact with gradational upper contact. Unit is 3 cm thick. 3 x 4 cm dropstone (?) spans upper contact. Shell fragment also near upper contact (to B.I.O.). Darker grains are more abundant near base of unit.

62-138 cm: 5y 4/1; Dark gray, homogenous, structureless mud. Irregular to elongate dark reduced patches dispersed throughout. Dark reduced parches are poorly defined but show vague horizontal orientation. 1.5 to 3 mm diameter burrows dispersed throughout in random orientation. Moderate to heavy burrowing.

DISTURBANCE: Upper 3 cm, flow during split.

Cambridge Fjord: Core CA-4.1, Core length=169 cm, 83-18106.

0-5 cm: 2.5y 3/2; Very dark greyish brown mud. Disturbed.

5-169 cm: 5y 4/1; Dark gray, homogeneous, structureless mud. Moderate burrowing with dark, reduced zones around polycheate burrows. Burrows are 1-2 mm in diameter and show random orientation. Dropstone at 37 cm, 6 x 3 cm, angular, quartz, feldspar, hornblende gneiss. Dropstone at 125 cm, 3 x 3 cm, very angular, plagioclase, quartz, hornblende pegmatite (?). Faint silty horizon at 55 cm, 1 cm thick. Small (< 2 mm) mica grains common. Upper and basal contacts are poorly defined. Unit appears to pinch out across core. Silt to fine sand bed at 83 cm. 5y 4/1; Dark gray, speckled black. Small (< 2 mm) mica grains common. Upper and basal contacts are gradational. Massive within unit. Unit is 2.5 cm thick

DISTURBANCE: Upper 5 cm, flow during split.

Cambridge Fjord: Core CA-4.2, Core length=155 cm, 83-18101.

0-5 cm: 5y 4/1; Dark gray speckled black (10% mafic grains), silty fine-medium cohesive sand. Disturbed.

5-28 cm: 5y 4/1; Dark gray speckled black (10% mafic grains), silty medium sands. Mica flakes common. Crude stratification over interval. Dropstone at 17 cm, 4 x 6 cm.

5y 4/1; Greenish-brown 2.5 cm thick clay-rich sand bed at 20-22.5 cm, poorly defined contacts. Dropstone at 26 cm, 1.5 x 4 cm, quartzo-feldspathic gneiss.

28-31 cm: 5y 4/1; Dark grey, speckled black-pink medium to coarse sandy layer. Fewer fines than in overlying silty sands. Poorly defined upper and lower contacts. Massive within unit.

31-43 cm: 5y 4/1; Dark gray, speckled black (10% mafic grains), silty medium sands. Mica flakes common.

43-47 cm: 5y 4/1; Dark gray, speckled black-pink coarse sand bed. Quartzo-feldspathic clasts up to 1 cm diameter. Clay intraclast near top of bed (5y 6/1). Unit is massive and shows a sharp basal and a vague upper contact. Coarsest grains are concentrated at 1 cm above basal contact with grain size fining above and below (slight grading).

47-64 cm: 5y 4/1; Dark gray, massive, sandy to silty mud with dispersed mica grains. Light to moderate burrowing with 1 to 3 mm diameter burrows in random orientation (polycheate ?).

64-66 cm: 5y 4/1; Dark gray, fine to medium sand bed. Moderately well defined, irregular upper and basal contacts. Massive within unit.

66-74 cm: 5y 4/1; Dark gray, massive, sandy to silty mud with dispersed mica grains. Light to moderate burrowing with 1 to 3 mm diameter burrows in random orientation (polychaete ?).

74-76 cm: 5y 3/1; Very dark gray, speckled black, fine to medium sand bed. Contains brown-black fibrous organic material. Sharp horizontal upper and basal contacts. massive within unit.

76-83 cm: 5y 4/1; Dark gray, sandy mud. Light to moderate burrowing (polycheate ?). Unit is slightly graded and shows a sharp basal contact.

83-105 cm: 5y 4/1; Dark gray, massive mud with dispersed silt to fine sand. Moderate burrowing over interval.

105-110 cm: 5y 3/1; Very dark gray, speckled black, fine to medium sand. Gradational upper and basal contacts. Massive within unit.

110-155 cm: 5y 4/1; Dark gray, massive mud with dispersed silt to fine sand. Burrows dispersed throughout interval (polycheate ?). Dropstone at 111.5 cm, 3 x 4 cm, quartz, feldspar, hornblende gneiss.

DISTURBANCE: Uppermost 3 cm, flow during split.

Cambridge Fjord: Core CA-6.0, Core length=268 cm, 83-18121.

Core shared with Geochem. Core log from archive half.

0-3 cm: 2.5y 4/2; Dark greyish brown soupy mud. Oxidized cap. Disturbed.

3-84 cm: 5y 4/1; Dark gray mottled black mud. Light burrowing. Burrows are 1 to 3 mm diameter and are in random orientation. Black reduced streaks-patches widely dispersed throughout and do not appear to be associated with open burrows. Black reduced patches-streaks are up to 0.5 cm width x 2.5 cm length. Large dropstone at 26 cm, 3 x 5 cm, granitic. Whispy silt to fine sand lenses at 39, 41, 47 and 66 cm. Lenses do not extend across core width and show sharp concave-up basal contacts and gradational upper contacts. Lenses are maximum thickness of 0.5 to 1.5 cm. Dropstone at 60 cm, 3 x 4 cm, granitic. Dropstone is associated with a horizon of increased silt to fine sand. Silty horizon shows poorly defined contacts. Colour change at 85-90 cm: 5y 5/ 1; Grey-brown mud.

90-96 cm: 5y 3/ 1; Very dark gray speckled black graded sand. Medium sand at base grading upward to fine sand to silt. Very sharp, scalloped (concave-up portions) basal contact. Gradational upper contact. Heavy minerals (dark) concentrated near basal contact. (Turbidite).

96-198 cm: 5y 4/ 1; Dark gray mottled black mud. Dark reduced patches-streaks and open burrows widely dispersed throughout in random orientation. Light burrowing.

Whispy silt to fine sand lenses at 128, 160 and 191 cm. Lenses do not extend across core width and show sharp basal contacts and poorly defined to gradational upper contacts. Lenses are maximum thickness of 0.3 to 1.5 cm.

198-211 cm: 5y 5/ 1; Gray, massive mud.

211-213 cm: 5y 5/ 1; Greyish-brown speckled black, graded fine sand to silt.Very sharp, slightly irregular basal contact. Upper contact gradational over 0.6 cm. Very angular amphibolite (?) clast 1 cm x 2 cm spans basal contact.

213-268 cm: 5y 4/ 1; Dark gray massive mud. Widely dispersed reduced dark streaks and open burrows throughout. Structureless.

DISTURBANCE: Upper 3 cm, flow during split. Upper 20 cm rotated during split.

NOTES: Graded fine sand to silt bed at 211-213 cm shows thin (0.3 to 0.7 mm) horizontal lamination. Coarser grains in lower laminae. Heavy minerals (dark) concentrated at base of two lower laminae.

Itirbilung Fjord: Core IT-0.1, Core length=226 cm, 83-18128.

Core shared with Geochem.

General: Entire core shows well defined lamination delineated by numerous sandy horizons 2 to 5 cm thick. Upper 40 cm of core soupy.

1-6 cm: 5y 4/2; Olive gray speckled black silt. Disturbed.

6-14 cm: 5y 4/ 1; Dark gray speckled black, graded fine sand to silt. Fine sand at base of unit grading upward into silt. Basal contact sharp and irregular.

Dark mafic grains are concentrated in lower 4 cm of unit. Vague laminations within unit. (Turbidite).

14-17.5 cm: 5y 4/2; Olive gray speckled black, structureless silty mud. Irregular contacts.

17.5-24 cm: 5y 4/1; Dark gray speckled black, fine sand. Mafic and mica grains dispersed throughout. Sharp, irregular basal contact. Gradational, irregular uppercontact. Structureless within unit. (Turbidite).

24-126 cm: 5y 4/3; Olive silty mud and mud alternating with slightly darker (5y 4/1) thin fine sand to silt layers. Fine sand to silt layers are < 1.5 cm thick.

28-29 cm: 5y 4/1; Dark gray speckled black, fine sand. Sharp concave-down basal contact (disturbance ?). Mafic grains concentrated at base of unit. (Turbidite).

30-31.5 cm: 5y 4/1; Dark gray speckled black slightly graded fine sand. Unit shows sharp, irregular basal contact and gradational (irregular) upper contact. Mafic grains show a slight increase in concentration near base of unit. (Turbidite).

27-31.5 cm: 10yr 4/6; Dark yellowish brown patches up to 1 x 1 cm dispersed throughout.

31-34.5 cm: 5y 4/1; Dark gray speckled black, silty mud.

34.5-36 cm: 5y 4/1; Dark gray speckled black, slightly graded fine sand. Unit shows sharp, irregular basal contact and gradational (irregular) upper contact. Mafic grains show an increase in concentration near baes of unit. (Turbidite).

36-40 cm: 5y 4/2; Olive gray speckled black silty mud.

40-43 cm: 5y 4/1; Dark gray speckled black, slightly graded, fine sand. Unit shows a very sharp irregular basal contact and gradational (irregular) upper contact. Mafic grains dispersed throughout unit. Structureless. (Turbidite).

Whispy fine sand laminae at 45, 46.5, 47.5, 49 and 52 cm. Fine sand laminae are maximum 1 cm thick. Mafic grains show a higher concentration in fine sand laminae.

49-52 cm: 5y 5/1; Gray silty mud.

57.5-58 cm: 5y 4/1; Dark gray silty horizon showing poorly defined contacts.

61-62 cm: 5y 4/1; Dark gray silty horizon showing poorly defined contacts.

63-64.5 cm: 5y 4 / 1; Dark gray speckled black silty layer showing a sharp basal and gradational upper contact. (Turbidite).

Vague silty horizons at 65.5, 67.5 and 71 cm. Horizons are approximately .5 cm thick and are speckled black (mafic grains). Contacts are poorly defined.

72-73.5 cm: 5y 4 / 1; Dark gray speckled black fine sand to silt layed. Unit shows sharp, horizontal to concave-down basal and upper contacts. Mafic grains dispersed throughout. (Turbidite).

76-76.5 cm: 5y 4 / 1; Dark gray speckled black fine sand to silt horizon showing sharp basal and gradational upper contacts.

78.5-80 cm: 5y 4 / 1; Dark gray speckled black, slightly graded fine sand to silt layer showing sharp, irregular basal and gradational upper contacts. (Turbidite).

82-82.7 cm: 5y 4 / 1; Dark gray speckled black, vague silty horizon.

89-91 cm: 5y 4 / 3; Olive speckled black, vague silty horizon.

92-94 cm 5y 4 / 1; Dark gray speckled black, graded fine sand bed. Unit shows sharp sub-horizontal basal and gradational upper contacts. (Turbidite).

98 cm: 5y 4 / 2; Olive gray speckled black silty horizon less than 1 cm thick.

100 cm: 5y 4 / 2; Olive gray speckled black silty horizon less than 1 cm thick.

101.5-124: 5y 4 / 3; Olive silty mud alternating with thin sandy units.

101.5-103 cm: 5y 4 / 2; Olive gray speckled black slightly graded fine sand bed. Unit shows a sharp basal contact with concave-up scours and a gradational upper contact. (Turbidite).

104.5-107 cm: 5y 4 / 2; Olive gray speckled black slightly graded fine sand bed. Unit shows a sharp basal contact with concave-up scours and a gradational upper contact. (Turbidite).

107.5-109 cm: 5y 4 / 2; Olive gray speckled black slightly graded fine sand bed. Unit shows a sharp basal contact with concave-up scours and a gradational upper contact. (Turbidite).

111-112.5 cm: 5y 4 / 2; Olive gray speckled black slightly graded fine sand bed. Unit shows a sharp basal contact with concave-up scours and a gradational upper contact. (Turbidite).

116-117.5 cm: 5y 4 / 2; Olive gray speckled black slightly graded fine sand bed. Unit shows a sharp basal contact with concave-up scours and a gradational upper contact. (Turbidite).

124-125.5 cm: 5y 4/2; Olive gray speckled black slightly graded fine sand bed. Unit shows a sharp basal contact with concave-up scours and a gradational upper contact. (Turbidite).

126-128.5 cm: 5y 4/1; Greenish-brown speckled black, graded fine sand showing sharp, horizontal basal and gradational upper contacts. Sands in unit are 20%-30% mafic grains. Unit shows vague stratification. (Turbidite).

128.5-168: 5y 4/3; Olive silty mud alternating with thin (<1.5 cm) fine sand to silt layers which are slightly darker (5y 4/1).

Thin fine sand to silt horizons at 129.5, 134, 137, 140, 143, 146, 151, 158, 162, 165, and 167 cm. Several layers show sharp basal and gradational upper contacts.

168-170 cm: 5y 4/1; Greenish-brown speckled black, graded fine sand showing sharp, scoured (concave-up) basal and gradational upper contacts. Sands in unit are 20%-30% mafic grains. Unit shows vague stratification. (Turbidite).

170-226 cm: 5y 4/3; Olive silty mud alternating with thin (.5 to 2 cm) silt to fine sand layers.

172 cm: 5y 4/3; Olive speckled black, thin fine sand horizon showing sharp, irregular basal and gradational upper contacts.

175-176 cm: 5y 3/2; Dark green reduced silty mud horizon showing sharp, sub-horizontal contacts.

Whispy fine sand to silt horizons at 179, 180.5, 183 and 185 cm. Units are <0.5 cm thick and show sharp, scoured (concave-up) basal and gradational upper contacts.

191-192.5 cm: 5y 4/2; Olive gray speckled black fine sand bed showing sharp, irregular to concave-up basal and gradational upper contacts. Unit shows vague stratification.

194-195 cm: 5y 4/2; Olive gray speckled black fine sand bed showing sharp, irregular to concave-up basal and gradational upper contacts. Unit shows vague stratification.

198-198.5 cm: 5y 4/2; Olive gray speckled black fine sand bed showing sharp, irregular to concave-up basal and gradational upper contacts. Unit shows vague stratification.

205-205.5 cm: 5y 4/2; Olive gray speckled black fine sand bed showing sharp, irregular to concave-up basal and gradational upper contacts. Unit shows vague stratification.

206-208 cm: 5y 4/2; Olive gray speckled black, graded fine sand to silt. Unit shows sharp basal and poorly defined upper contacts.

208-209.5 cm: 5y 4/1; Dark gray speckled black graded fine to medium sand bed showing sharp, sub-horizontal basal and irregular, poorly defined upper contacts. Unit contains 10% to 15% mafic grains.

212-212.7 cm: 5y 4/1; Dark gray speckled black, fine to medium sand showing sharp basal and upper contacts. Unit is massive and pinches out across core width.

Whispy fine sand to silt horizons at 213.5, 217, 220 and 223 cm. Units are <0.5 cm thick and show sharp basal contacts at 213.5 and 217 cm. Other contacts are poorly defined.

DISTURBANCE: Upper 5 cm, flow during split. Upper 40 cm appears "stretched".

NOTES: Core appeared "soggy" and offered little resistance to spatulas (weak). Sediments flowed and filled water content holes after approximately 2hr.

Itirbilung Fjord: Core IT-0.3, Core length=142 cm, 83-18131.

General: Silty mud with numerous thin (<2 cm thick) sandy units and 4 thick (3-5.5 cm thick) sandy units.

1-3 cm: 5y 4/3; Olive, structureless, soupy mud. Disturbed.

3-10 cm: 5y 4/2; Olive gray mud to silty mud. Silty layers are approximately 2 cm thick and show vague or poorly defined upper and basal contacts. Silty layers are at 4-6 cm and 9-11 cm. Light burrowing.

9-10 cm: Organic material (roots?) pulled out of core during split.

14-15 cm: 5y 4/1; Dark gray speckled black-gold, graded fine to medium sand. Very sharp basal contact. Unit grades upward into silty mud. (Turbidite).

15-45 cm: 5y 4/1; Dark gray silty mud alternating with fine to medium sand layers up to 2.5 cm thick. Silty muds show light burrowing with 1.5-3 mm diameter burrows in random orientation.

18.5-21 cm: 5y 4/1; Dark gray speckled black-gold, fine to medium sand. Basal and upper contacts are poorly defined.

Whispy-discontinuous, fine to medium sand horizons at 22, 25, and 31 cm. Units are 0.5 to 1 cm thick and show sharp basal and gradational upper contacts.

29-29.5 cm: 5y 4/1; Dark gray speckled black-gold, fine to medium sand horizon. Unit extends across core and shows sharp basal and gradational upper contacts.

Whispy- discontinuous fine to medium sand horizons at 39 and 40.5 cm. Units show sharp basal and gradational upper contacts.

42-42.5 cm: 5y 4/1; Dark gray speckled black-gold, fine to medium sand horizon. Unit extends across core and shows sharp basal and gradational upper contacts.

45-47.5 cm: 5y 3/1; Very dark gray speckled black-gold, fine to medium graded sand bed. Crude horizontal stratification within unit. Very sharp basal contact. Unit grades upward into silty mud. (Turbidite).

47.5-50 cm: 5y 4/2; Olive gray structureless mud.

50-55 cm: 5y 4/1; Dark gray mottled black, structureless mud. Dark reduced patches-streaks show slight horizontal orientation and increase in concentration down-core over interval.

55-67.5 cm: 5y 4/2; Olive gray, structureless mud to silty mud alternating with slightly darker (5y 4/1) whispy fine to medium sand horizons. Whispy sands show sharp, irregular to concave-up basal contacts and poorly defined upper contacts. Whispy sand horizons at 54 cm (1 cm thick) and 59 and 63 cm (.5 cm thick).

67.5-70.5 cm: 5y 3/1; Very dark gray speckled black-gold fine to medium graded sand bed. Very sharp, concave-up (scoured) basal contact and gradational upper contact. Unit contains sub-horizontal laminae 1-2 mm thick which are defined by higher concentrations of dark (mafic) grains. Unit appears lenticular. (Turbidite).

70.5-75 cm: 5y 4/2; Olive gray, structureless mud to silty mud. Whispy fine to medium sand horizon at 71.5 cm. Sand horizon is approximately 0.5 cm thick.

75-80.5 cm: 5y 3/1; Very dark gray speckled black-gold, fine to medium graded sand. Very sharp, sub-horizontal basal contact and gradational upper contact. Crude stratification within unit. Unit appears lenticular (unit "pinches out" across the core) (Turbidite).

80.5-142 cm: 5y 4/1 to 5y 4/2; Olive gray mud to silty mud alternating with occasional thin (<0.7 cm thick) fine to medium sand horizons. Light burrowing with 1.3 to 3 mm diameter burrows in random orientation.

91.5-92 cm: Fine sand horizon showing sharp basal and gradational upper contacts.

101-101.7 cm: Discontinuous fine to medium sand horizon showing sharp, irregular basal contact and poorly defined upper contact.

115-115.7 cm: Discontinuous fine to medium sand horizon showing sharp, irregular basal contact and poorly defined upper contact.

110-115 cm: Interval showing increased concentration of dark reduced patches-streaks (well defined, elongate, curved filled burrows).

120-120.7 cm: Fine to medium sand horizon showing sharp, irregular basal contact and poorly defined upper contact.

124-124.7 cm: Fine to medium sand horizon showing sharp, irregular basal contact and gradational upper contact.

Whispy-discontinuous fine to medium sand horizons at 125.5 and 136.5 cm.

DISTURBANCE: Upper 3 cm, flow during split.

Itirbilung Fjord: Core IT-0.4, Core length=137 cm, 83-18134.

General: Core very similar to core IT-0.3. Green-brown mud to silty mud with 4 thick (2.5 to 5.5 cm thick) turbidites. Numerous thin (<2 cm thick) sandy units in upper half of core.

1-5 cm: 5y 4/3; Olive, structureless, soupy, silty mud. Oxidized cap. Disturbed.

5-33 cm: 5y 4/3 to 5y 4/2; Olive gray, structureless mud to silty mud alternating with slightly darker (5y 4/1 to 5y 4/2) speckled black-gold, thin silt to fine sand layers. Very light burrowing. Whispy-discontinuous silt to fine sand horizon at 8 cm, concave-up, irregular basal and poorly defined upper contacts, 0.5 cm maximum thickness.

12-13.5 cm: Fine to medium sand horizon grading upward to silt to silty mud. Unit is 1 to 1.5 cm thick and shows sharp, irregular to concave-up basal and clearly gradational upper contact.

15-17 cm: Fine to medium sand horizon grading upward to silt to silty mud. Very irregular, sharp basal and gradational upper contact.

26-27 cm: Fine sand horizon showing sharp, sub-horizontal basal contact and gradational upper contact.

28.5-30.5 cm: Fine sand horizon showing sharp, sub-horizontal basal contact and gradational upper contact.

contact and gradational upper contact.

35.5-36.5 cm: Fine sand horizon showing sharp, sub-horizontal basal 33-34 cm: Very irregular, discontinuous fine sand horizon.

38-42.5 cm: 5y 3/2; Dark olive gray speckled black-gold graded fine sand to silt bed. Very sharp, sub-horizontal basal contact with concave-up portions on contact (scoured). Upper contact is clearly gradational. Unit shows vague horizontal stratification defined by higher concentrations of mafic grains. (Turbidite).

42.5-57 cm: 5y 4/3; Olive, structureless mud to silty mud. Very light burrowing over interval. Few dark reduced patches-streaks between 46 and 49 cm.

49-50 cm: Fine sand horizon, very irregular.

57-59.5 cm: 5y 3/2; Dark olive gray speckled black-gold graded fine sand to silt bed. Very sharp, sub-horizontal basal contact with concave-up portions on contact (scoured). Upper contact is clearly gradational. Unit shows vague horizontal stratification defined by higher concentrations of mafic grains. (Turbidite).

59.5-65 cm: 5y 4/3; Olive, structureless silty mud to mud. Very light burrowing. Whispy-discontinuous silt to fine sand horizon at 62 cm, horizon is 0.5 cm thick and shows a sharp basal contact with concave-up portions.

65-70.5 cm: 5y 3/2; Dark olive gray speckled black-gold graded fine to medium sands. Very sharp, sub-horizontal basal contact with concave-up portions on contact (scoured). Upper contact is clearly gradational. (Turbidite).

70.5-130 cm: 5y 4/1 to 5y 4/2; Olive gray, structureless mud to silty mud alternating with whispy-discontinuous silt to fine sand horizons. Light burrowing over interval with 1-2 mm diameter open burrows widely dispersed throughout in random orientation. Dark reduced patches-streaks also widely dispersed throughout. Whispy-discontinuous silt to fine sand horizons at 94, 108, 116 and 122 cm. Units are <0.5 cm thick. Whispy unit at 116 cm contains 1.5 x 1 cm dropstone.

130-135.5 cm: 5y 4/1 to 5y 3/1; Very dark gray speckled black-gold graded fine sand to silt bed. Unit shows very sharp basal contact with concave-up sections (scoured). Upper contact is gradational. Vague horizontal stratification within unit is defined by dark (mafic) grains.

DISTURBANCE: Upper 3 cm, flow during split.

Itirbilung Fjord: Core IT-1.1, Core length=142 cm, 83-18139.

General: Very similar to structureless Cambridge fjord cores. Firm mud.

1-5 cm: 5y 4/3; Olive structureless soupy mud. Disturbed.

5-19 cm: 5y 4/2; Olive gray structureless silty mud. Moderate burrowing. 1-3 mm diameter open burrows dispersed throughout interval in random orientation. Irregular olive brown patches (2.5y 4/4) up to 1 x 3 cm also dispersed throughout.

19-70 cm: 5y 4/1; Dark gray mottled black, structureless mud to silty mud. Light to moderate burrowing. 1-3 mm diameter open burrows dispersed throughout interval in random orientation. Dark reduced patches-streaks widely dispersed throughout interval and show slight horizontal orientation.

70-73 cm: 5y 4/1; Dark gray structureless sandy mud (fine to medium sand). Upper and basal contacts are sharp and irregular. Sand unit pinches out at edge of core.

73-81 cm: 5y 4/1; Dark gray mottled black, structureless mud to silty mud. Light to moderate burrowing. 1-3 mm diameter open burrows dispersed throughout in random orientation. Interval shows approximately 15% dark reduced patches-streaks with pronounced sub-horizontal orientation.

81-85 cm: 5y 4/1; Dark gray mottled black, structureless sandy mud (fine to medium sand). Basal contact sharp and irregular. Vague upper contact. Contacts are sub-horizontal and extend across the core.

85-108 cm: 5y 4/1; Dark gray mottled black, structureless mud to silty mud. Light to moderate burrowing. 1-3 mm diameter open burrows dispersed throughout in random orientation. Interval shows approximately 15% dark reduced patches-streaks with pronounced sub-horizontal orientation.

108-111 cm: 5y 4/1; Dark gray speckled black, silt to fine sand with sharp, irregular, sub-horizontal basal contact and gradational upper contact. (Turbidite).

111-142: 5y 4/1; Dark gray mottled black, structureless mud. Dark reduced patches-streaks are well defined and strongly resemble burrows. Reduced areas are elongate 1-3 mm diameter tubes which show random orientation. Several branch. (Moderate burrowing). Dropstone at 122 cm, 2 x 1.5 cm, angular amphibolite.

DISTURBANCE: Upper 5 cm, flow during split.

Itirbilung Fjord: Core IT-1.2, Core length=117 cm, 83-18137.

General: Similar to Cambridge fjord cores. Structureless, burrowed, reduced, firm mud.

1-4 cm: 5y 4/3; Olive, structureless, soupy, silty mud. Oxidized cap. Disturbed.

4-21 cm: 5y 3/1; Very dark gray mottled black and olive brown (2.5y 4/4) structureless silty mud. Light to moderate burrowing. Rusty patches associated with 3-5 mm diameter open burrows. Dark reduced patches-streaks widely dispersed throughout interval. Few open burrows below 21 cm.

21-117 cm: 5y 3/1; Very dark gray mottled black, structureless silty mud alternating with fine to medium sand layers. Dark reduced black patches-streaks are well defined, elongate, often curved and randomly orientated (filled burrows). Moderate burrowing (involves 15-20% of sediment).

Fine to medium sand horizons occur at 34-35.5 cm, 55-57 cm, 67-68.5 cm, 75.5-78 cm, 83.5-86 cm, 90-92 cm, 93-94.5 cm, 103-104.5 cm, 106-108.5 cm and 110-112 cm. Upper and basal contacts are poorly defined or gradational. Sandy horizons are defined by a higher concentration of coarse sediments and a speckled black-gold colour (mafic grains+micas).

DISTURBANCE: Upper 4 cm, flow during split.

Itirbilung Fjord: Core IT-2.2, Core length=211 cm, 83-18154.

General: Structureless, burrowed green-brown mud with a few (4) fine to medium sand layers in upper half of core.

0-3 cm: 5y 4/2; Olive gray, structureless, soupy silty mud. Oxidized cap. Disturbed.

3-27 cm: 5y 4/2; Olive gray mottled black, structureless silty mud with widely dispersed dark reduced patches-streaks.

27-29 cm: 5y 4/1; Dark gray speckled black-gold, graded sandy mud. Medium sandy mud at base of unit grades upward to fine sandy mud. Unit showes sharp, irregular basal and gradational upper contacts. Structureless within unit.

29-73 cm: 5y 3/1; Very dark gray mottled black, structureless, burrowed mud. Open burrows are 1.5 to 4 mm in diameter. Dark reduced patches-streaks are elongate-curved (up to 0.4 x 3 cm) or round (up to 0.5 cm diameter).(filled burrows). Moderate burrowing. Interval contains dropstones and several fine to medium sand horizons. Dropstone at 38 cm, 1.5 x 2 cm, migmatite? Dropstone at 55 cm, 10 x 6 cm migmatite?

61-63 cm: 5y 3/1; Very dark gray speckled black-gold, whispy-discontinuous fine to medium sand horizon. Basal and upper contacts are sharp and irregular.

66-68 cm: 5y 3/1; Very dark gray speckled black-gold, structureless, fine to medium sand bed. Basal and upper contacts are sharp and irregular. Unit pinches out across core width.

71-73 cm: 5y 2.5/1; Greenish-black speckled black-gold, structureless medium sand bed. Basal and upper contacts are sharp and irregular.

73.5-211 cm: 5y 4/1 to 5y 3/1; Very dark gray mottled black, structureless, burrowed, silty mud. Homogeneous. Dark reduced patches-streaks are elongate-curved to round (up to 3 x 5 cm) and are well defined (filled burrows). Moderate to heavy burrowing. Whispy-discontinuous fine to medium sand horizon at 192 cm, Very irregular, sharp upper and lower contacts.

DISTURBANCE: Upper3 cm, flow during split. Upper 28 cm rotated during split.

NOTES: Dropstone found at base of sand unit at 71-73.5 cm. 4 by 2 cm, angular migmatite? Possible association of dropstones with "non turbidite" sands?

Itirbilung Fjord: Core IT-2.3, Core length=230 cm, 83-18159.

General: Green-brown, homogeneous, structureless silty mud with 3 thick (3 to 5 cm thick) medium sand beds. Moderate to heavy burrowing.

0-10 cm: 5y 4/3; Olive, structureless, soupy, silty mud. Oxidized cap. Disturbed.

10-90 cm: 5y 4/2; Olive gray mottled black, structureless silty mud. Light to moderate burrowing with 1-2 mm diameter open burrows in random orientation. Dark reduced burrows well defined, elongate, curved and in random orientation. Reduced burrows are up to 0.5 x 4 cm. and increase in concentration down-core over interval (20% at base).

90-95 cm: 5y 4/2; Olive gray speckled black, structureless, muddy medium sand bed. Basal and upper contacts are poorly defined and irregular. Unit thins to 2 cm over core width. Structureless. Possible escape burrow near upper contact.

95-135 cm: 5y 4/1 to 5y 4/2; Olive gray mottled black, structureless silty mud. Heavy burrowing with dark reduced filled burrows up to 1 x 4 cm in random orientation (30%). Whispy-discontinuous sandy to silty mud horizons at 110 and 132 cm, Horizons are approximately 0.5 cm thick.

132-183 cm: 5y 4/2; Olive gray mottled black, structureless mud to silty mud. Moderate to heavy burrowing with well defined, elongate, curved, reduced, filled burrows up to 0.5 x 4 cm. 1-2 mm diameter open burrows widely dispersed throughout interval. filled and open burrows are in random orientation.

183-185 cm: 5y 3/ 1; Very dark gray speckled black-gold, graded medium to fine sand bed. Clear (not sharp), irregular upper and basal contacts. Unit pinches out across core width. Light (felsic) grains concentrated in 0.5 cm thick laminae near upper contact. Unit is otherwise structureless.

185-193 cm: 5y 4 / 2; Olive gray mottled black, structureless mud to silty mud. Moderate to heavy burrowing with well defined, elongate, curved, reduced, filled burrows up to 0.5 x 4 cm. 1-2 mm diameter open burrows widely dispersed throughout interval. filled and open burrows are in random orientation.

193-195 cm: 5y 3/ 1; Very dark gray speckled black-gold, slightly graded medium sand bed. Upper and basal contacts are, clear, irregular, and sub-horizontal. Sand filled burrow(?) at base (1.5 cm x 1 cm). Possible escape burrow near upper contact.

185-230 cm: 5y 4 / 2; Olive gray mottled black, structureless mud to silty mud. Moderate to heavy burrowing with well defined, elongate, curved, reduced, filled burrows up to 0.5 x 4 cm. 1-2 mm diameter open burrows widely dispersed throughout interval. filled and open burrows are in random orientation.

DISTURBANCE: Upper 10 cm, flow during split. Upper 30 cm rotated during split.

Itirbilung Fjord: Core IT-3.1, Core length=248 cm, 83-18161.

General: Green-brown, homogeneous, structureless, silty mud to mud. Light burrowing with intervals of moderate to heavy burrowing.

0-10 cm: 5y 4 / 3; Olive structureless mud. oxidized cap. Relatively firm for uppermost sediments. Disturbed.

10-108 cm: 5y 4 / 1 to 5y 4 / 2; Olive gray mottled black, structureless silty mud. Light burrowing with 1-2 mm diameter open burrows widely dispersed throughout interval. Poorly defined dark reduced patches-streaks up to 1 x 3 cm widely dispersed throughout in random orientation.

30 cm: Large burrow, 1.5 cm x 2 cm diameter.

80-108 cm: Dark reduced patches-streaks show slight horizontal orientation.

108-131 cm: 5y 4 / 1 to 5y 3/ 1; Very dark gray mottled black, structureless silty mud. Interval shows a higher concentration of dark reduced patches-streaks which show better definition (filled burrows) and slight horizontal allignment.

131-248 cm: 5y 4 / 2; Olive gray mottled black, structureless silty mud to mud (mud below 180 cm). Light to moderate burrowing with 1-2 mm diameter burrows widely dispersed throughout interval in random orientation. Dark reduced filled burrows also widely dispersed throughout interval in random orientation.

DISTURBANCE: Upper 10 cm, disturbed during split. Upper 40 cm rotated during split.

McBeth Fjord: Core MC-0.1, Core length=220 cm, 83-18173.

General: Green-brown, homogeneous, structureless silty mud to mud. Heavily burrowed. Thin silt to sand horizons widely dispersed throughout.

1-4 cm: 5y 4/2; Olive gray, structureless, soupy, silty mud. Oxidized cap. Disturbed.

4-22 cm: 5y 4/2; Olive gray mottled black, structureless silty mud. Light to moderate burrowing with 1-3 mm diameter open burrows in random orientation. Dark reduced filled burrows up to 4 mm diameter also in random orientation.

22-25 cm: 5y 4/2; Olive gray speckled black, massive, fine to silty muddy sand. upper and basal contacts irregular and poory defined (whispy). Angular dropstone, 2 x 4 cm amphibolite? near basal contact.

25-65 cm: 5y 4/2 to 5y 4/1; Dark gray, structureless silty mud to mud. Moderate to heavy burrowing with 1-2 mm diameter open burrows in random orientation. Dark reduced filled burrows up to 0.4 x 2 cm.

65-196 cm: 5y 4/2; Olive gray, structureless silty mud to mud. Moderate to heavy burrowing with 1-3 mm diameter open burrows in random orientation. One burrow at approximately 88 cm is filled (black) over 2 cm of length and open over 2 cm of exposed length. Dark reduced filled burrows are well defined and up to 0.4 cm by 2 cm in random orientation. (10% to 15% of core surface).

97-97.5 cm: 5y 4/2; Olive gray, structureless, soupy mud. Poorly defined sub-horizontal contacts.

105-105.7 cm: 5y 4/2; Olive gray speckled black fine to medium sand lens. Lens pinches out across core width. Sharp, irregular, concave-up basal contact and gradational upper contact.

196-197 cm: 5y 3/1; Very dark gray speckled black, slightly graded silt to fine sand. Sharp, irregular basal contact and gradational upper contact. Dark (mafic) grains concentrated in lower portion of unit. Unit thins over core width.

197-201 cm: 5y 4/2; Olive gray, structureless silty mud to mud. Moderate to heavy burrowing with 1-3 mm diameter open burrows in random orientation. Dark reduced filled burrows are well defined and up to 0.4 cm by 2 cm in random orientation. (10% to 15% of core surface).

201-203 cm: 5y 4/1; Dark gray speckled black fine sand. Sharp, irregular Basal contact. Grading not apparent. Possible escape burrow near upper contact.

203-220 cm: 5y 4/2; Olive gray, structureless silty mud to mud. Moderate to heavy burrowing with 1-3 mm diameter open burrows in random orientation. Dark reduced filled burrows are well defined and up to 0.4 cm by 2 cm in random orientation. (10% to 15% of core surface).

DISTURBANCE: Upper 4 cm, flow during split. upper 45 cm rotated during split.

McBeth Fjord: Core MC-2.0, Core length=240 cm, 83-18170.

General: Green-brown, homogeneous, structureless silty mud to mud. Heavy burrowing.

0-4 cm: 5y 4/2; Olive gray, structureless, soupy mud. Oxidized cap. Disturbed.

4-10 cm: 5y 4/2; Olive gray structureless mud. Light burrowing. Irregular rusty (7.5y 6/6) zones around burrows. Burrows 2-3 mm diameter.

10-14 cm: 5y 4/2; Olive gray speckled black, muddy fine to medium sand. Basal and upper contacts are poorly defined. Unit is mafic rich and massive.

14-53 cm: 5y 4/2; Olive gray, structureless mud to silty mud. Moderate burrowing with 1-3 mm diameter open burrows in random orientation. Dark reduced filled burrows widely dispersed throughout interval. Dropstone at 45 cm, 2 x 1.5 cm, angular amphibolite?

53-240 cm: 5y 4/2 to 5y 4/1; Dark gray structureless mud. Heavy burrowing with 1-3 mm diameter open burrows concentrated throughout interval in random orientation. Dark reduced filled burrows up to 0.5 x 2.5 cm dispersed throughout (15% to 20% of core surface).

240 cm: top of fine to medium sand unit. Sharp contact.

DISTURBANCE: Upper 4 cm, flow during split. Upper 60 cm rotated during split.

McBeth Fjord: Core MC-2.1, Core length=240 cm, 83-18165.

General: Green-brown, homogeneous, structureless silty mud to mud. Moderate burrowing. Several large dropstones.

0-6 cm: 5y 4/2; Olive gray, structureless, soupy, silty mud. Oxidized cap. Disturbed.

6-80 cm: 5y 4/2; Olive gray, structureless mud to silty mud. Moderate burrowing with 1-3 mm diameter burrows in random orientation. Poorly defined, dark reduced patches-streaks widely dispersed throughout. Dark reduced patches-streaks up to 1 x 1 cm. Dropstone at 65 cm, 4 x 5 cm, subangular migmatite? Dropstone at 80 cm, 4 x 6 cm, subangular migmatite? Numerous coarse sand to granule clasts dispersed in mud surrounding dropstone.

80-110 cm: 5y 4/2; Olive gray, structureless mud to silty mud. Moderate to heavy burrowing with 1-3 mm diameter burrows in random orientation. Well defined, dark reduced patches-streaks widely dispersed throughout. Dark reduced patches-streaks up to 1 x 1 cm. Dropstone at 106 cm, 1 x 1.5 cm, angular. Dropstone at 110 cm, 5 x 7 cm, subrounded, Black reduced surface. Several granule clasts dispersed in mud surrounding dropstone.

110-205 cm: 5y 4/2; Olive gray, structureless silty mud. Moderate to heavy burrowing with 1-3 mm diameter open burrows widely dispersed throughout. Dark reduced filled burrows up to 0.5 x 3.5 cm dispersed throughout interval in random orientation.

205-208 cm: 5y 4/2; Olive gray muddy medium sand. basal and upper contacts are poorly defined. Unit pinches out to approximately 1 cm thick over core width. 1 x 1.5 cm dropstone near basel contact.

208-240 cm: 5y 4/2; Olive gray, structureless silty mud. Moderate to heavy burrowing with 1-3 mm diameter open burrows widely dispersed throughout. Dark reduced filled burrows up to 0.5 x 3.5 cm dispersed throughout interval in random orientation.

DISTURBANCE: Upper 6 cm, flow during split. Upper 30 cm rotated during split.

McBeth Fjord: Core MC-4.1, Core length=234 cm, 83-18181.

General: Green-brown, silty to sandy mud with numerous sand horizons and beds.

0-4 cm: 5y 4/2; Olive gray speckled black, structureless, soupy, silty to sandy mud. Oxidized cap. Disturbed.

4-16 cm: 5y 4/2; Olive gray speckled black, structureless, silty to fine sandy mud alternating with grey (5y 5/1) speckled black fine to medium sand layers. Contacts are sub-horizontal and poorly defined. Fine to medium sands are structureless. Sand layers are at 10-11 cm and 12-12.5 cm.

16-20 cm: 5y 4/2; Olive gray speckled black, clean, fine to medium sand. upper and basal contacts are sub-horizontal and poorly defined. Unit is structureless.

20-23 cm: 5y 4/2; Olive gray speckled black, silty to fine sandy structureless mud.

23-25 cm: 5y 4/2; Olive gray speckled black, clean, fine to medium sand. upper and basal contacts are sub-horizontal and poorly defined. Unit is structureless.

25-52 cm: 5y 4/2; Olive gray speckled black, structureless, silty to fine sandy mud. Light burrowing with dark reduced burrows widely dispersed throughout interval. Whispy-discontinuous fine to medium sand lenses at 28, 32, 34, and 41 cm, Poorly defined contacts.

52-53 cm: 5y 4/1; Dark gray speckled black, slightly graded, fine to medium sand layer. Sub-horizontal, clear (not sharp) basal contact and gradational upper contact.

53-85 cm: 5y 4/2 to 5y 4/1; Dark gray speckled black, structureless, silty to fine sandy mud. Moderate burrowing with dark reduced filled burrows up to .3 x 1.5 cm dispersed throughout interval in random orientation. Interval of higher fine to medium sand concentration at 70-73 cm. Gradational contacts.

85-87 cm: 5y 4/1; Dark gray speckled black, structureless, muddy, fine to medium sand. Upper and basal contacts are poorly defined.

87-128 cm: 5y 4/2 to 5y 4/1; Dark gray speckled black, structureless, silty to fine sandy mud. Moderate burrowing with dark reduced filled burrows up to 2 cm x 0.6 cm diameter.

104.5-106 cm: Interval of slightly lighter colour (5y 4/2). clear (not sharp) upper and basal contacts.

128-130 cm: 5y 4/1; Dark gray speckled black, structureless, muddy, fine to medium sand. Upper and basal contacts are poorly defined.

130-174 cm: 5y 4/1; Dark gray speckled black, structureless, silty to fine sandy mud. Light burrowing. Interval of increased fine to medium sand concentration at 135-137 cm.

174-234 cm: 5y 4/1; Dark gray speckled and mottled black, structureless mud. Moderate burrowing with dark reduced filled burrows up to 2.5 cm x 0.5 cm diameter. Dark reduced filled burrows show horizontal orientation.

DISTURBANCE: Upper 4 cm, flow during split. Upper 60 cm rotated during split.

8. APPENDIX 2. CORE DESCRIPTIONS: X-RAY LOG

Core CA-1.1

0-5 cm: Coarse subrounded to subangular clasts concentrated in irregular "pod" 3 X 5 cm in size. Clasts are up to 10 by 12 mm. Finer sediment in interval is massive with slightly mottled texture. Light lamina at 4 cm is 8 mm thick, shows grainy texture and indistinct contacts.

5-12 cm: Massive with slightly mottled texture. Subrounded to angular clasts are concentrated in irregular "pod" over 7-12 cm. "Pod" is 3 X 5 cm. Clasts are up to 23 X 15 mm.

12-18 cm: Massive with light burrowing. Burrows are 1-2 mm diameter, up to 3 cm in length and show a slight preference for horizontal alignment. Subrounded to subangular clasts are concentrated along edge of core. Clasts are up to 8 X 12 mm.

18-24 cm: Interval shows coarse grainy texture with subrounded to subangular clasts up to 7 X 16 mm. Upper and lower contacts are distinct and irregular. Normal grading is slightly developed over interval.

24-40 cm: Massive with light to moderate burrowing. Burrows are 1-2 mm diameter, up to 3 cm in length and show random orientation. Irregular "pods" showing coarse grainy texture occur at 27, 28, 31 and 34 cm. "pods" range from 1.2 X 3 cm to 2.5 X 3 cm. Subrounded to subangular clasts in "pods" are up to 7 X 10 mm. 40-88 cm: Massive with light to moderate burrowing. Burrows are 1-2 mm diameter, up to 3 cm in length and show random orientation except over 45-52 cm where they show a slight preference for horizontal alignment. Subrounded to angular clasts up to 7 X 18 mm are widely dispersed throughout interval. 40-42 cm shows grainy texture and indistinct contacts.

80-93 cm: Massive with light burrowing. Subangular clast at 81 cm, 10 X 6 mm.

93-102 cm: Massive with very light burrowing. Interval shows slight grainy texture.

102-192 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 4 cm in length and show random orientation. poorly defined light interval at 129-131 cm shows indistinct contacts. Subrounded clast at 148 cm, 3 X 3 mm. subrounded clast at 171 cm, 12 X 17 mm.

192-210 cm: Massive with slightly mottled texture. Interval shows very light burrowing.

Core CA-1.2

0-4 cm: Coarse clasts are concentrated in two irregular "pods" 2 X 3 and 1 X 5 cm in size. Otherwise interval is massive with clasts up to 2 X 3 mm dispersed throughout.

4-8 cm: Magnetic subsample. Edge of core is massive with subangular clasts up to 3 X 4 mm dispersed throughout.

8-11 cm: Geotech subsample - disturbed.

11-17 cm: Massive with subangular clasts dispersed throughout interval and one large subrounded clasts 6.5 X 6 cm.

17-25 cm: Massive with slightly mottled texture. Subrounded clasts up to 4 X 5 mm dispersed throughout interval.

25-33 cm: Magnetic subsample. Core edge is massive and slightly mottled.

33-41 cm: Massive with irregular "pod" of subangular clasts 1 X 2 mm to 8 X 11 mm in size at 34-36 cm.

41-48 cm: Magnetic subsample. Core edge is massive.

48-51 cm: Very faint alternating light-dark whispy laminae 1-2 mm thick.

51-56 cm: Geotech subsample. Core edge is massive with slightly mottled texture.

56-73 cm: Massive with light to moderate burrowing. Burrows are 1-2 mm diameter, up to 5 cm in length and show random orientation. Subangular clast at 60 cm, 3 X 7 mm.

73-80 cm: Magnetic subsample. Core edge shows light burrowing.

80-88 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 4 cm in length and show random orientation.

88-94 cm: Geotech subsample. Core edge is massive.

94-97 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 4 cm in length and show random orientation.

97-104 cm: Magnetic subsample. Core edge shows moderate to heavy burrowing. 104-107 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 4 cm in length and show random orientation.

107-112 cm: Geotech subsample.

112-121 cm: Magnetic subsample. Core edge shows moderate to heavy burrowing - partially disturbed.

121-134 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 4 cm in length and show random orientation.

134-141 cm: Magnetic subsample. core edge shows moderate to heavy burrowing - partially disturbed.

141-156 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 7 cm in length and show random orientation. Subrounded clast at 141 cm, 3 X 4 mm. Subrounded clast at 145 cm, 3 X 3 mm. Subangular clast at 149 cm, 5 X 9 mm.

156-161 cm: Geotech subsample. Core edge shows light burrowing.

161-164 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 3 cm in length and show random orientation.

164-172 cm: Magnetic subsample. Core edge is disturbed.

172-180 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter, up to 8 cm in length and show random orientation.

180-187 cm: Magnetic subsample. Core edge shows light burrowing.

187-194 cm: Geotech subsample. Core edge is massive.

194-200 cm: Massive or disturbed.

Core CA-1.6

0-4 cm: Geotech subsample. Disturbed.

4-7 cm: Massive interval with grainy texture and dispersed subrounded to subangular clasts up to 7 X 7 mm. Contacts are indistinct.

7-24 cm: Massive with dispersed subrounded to subangular clasts ranging from 10 X 10 to 7 X 10 mm. Large subrounded clast at 19 cm, 7.5 X 4 cm.

24-29 cm: Geotech subsample. Core edge is massive.

29-40 cm: Massive showing faint mottled texture and light burrowing.

Burrows are 1-2 mm diameter, up to 7 cm in length and show a slight preference for horizontal alignment.

40-43 cm: Geotech subsample. Core edge is massive.

43-56 cm: Massive. Pelecypod shell fragment at 44 cm.

56-60 cm: Geotech subsample. Core edge shows light, graded bed with grainy texture. Lower contact is very irregular and distinct. Upper contact is indistinct.

60-69 cm: Faint, laterally discontinuous, whispy laminae 1 to 3mm thick throughout interval and slightly concentrated between 67 and 69 cm.

69-80 cm: Magnetic subsample. Core edge shows slightly mottled texture.

80-85 cm: Geotech subsample. Core edge shows mottled texture.

85-95 cm: Very faint, light, whispy laminae 7-10 mm thick at 87, 89.5 and 93 cm. Light burrowing throughout interval. Burrows are 1-2 mm diameter and show slight preference for subhorizontal alignment over interval.

95-105 cm: Magnetic subsample. Core edge shows mottled texture.

105-109 cm: Geotech subsample. Core edge shows mottled texture.

109-119 cm: Massive with slightly mottled texture.

119-124 cm: Geotech subsample. Core edge shows mottled texture.

124-136 cm: Massive with mottled texture. Disturbed near base.

Core CA-4.1

0-4 cm: Geotech subsample.

4-13 cm: Matrix supported massive pebbly mud. Clasts are subangular to angular and are up to 21 X 15 mm. Clasts larger than 2 mm diameter account for approximately 25% of the material. The unit shows a sharp, subhorizontal basal contact. Dessication crack (?) at base of interval, 3 X 1 cm.

13-22 cm: Massive with slightly mottled texture. Clasts up to 5 X 7 mm dispersed throughout interval.

22-26 cm: Geotech subsample.

26-29 cm: Massive with slightly mottled texture. Clasts up to 3 X 4 mm dispersed throughout interval.

29-38 cm: Magnetic subsample - disturbed. Large subangular clast in interval, 3 X 6 cm.

38-42 cm: Massive with slightly mottled texture. Faint burrows 2 mm diameter and up to 23 mm in length show random orientation. Clast at 38.5 cm, 6 X 8 mm.

42-48 cm: Massive with mottled to slightly grainy texture.

48-52 cm: Geotech subsample. Core edge shows poorly defined alternating light-dark laminae 3-7 mm thick.

52-60 cm: Massive with slightly mottled to slightly grainy texture. 4 Subangular clasts up to 10 X 10 mm at 56 to 58 cm.

60-61 cm: Dark lamina up to 1 cm thick showing grainy texture. Basal contact is sharp and slightly irregular. Upper contact is indistinct. Lamina does not extend across core width. Subrounded clast at 61.5 cm, 5 X 7 mm.

61-67 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation. Clasts up to 2 X 2 mm widely dispersed throughout interval.

67-71 cm: Laterally discontinuous, light whispy laminae 2-4 mm thick. Laminae show poorly defined contacts and slight grainy texture. Interval shows light burrowing. Angular clast at 68 cm, 12 X 16 mm.

71-80 cm: Massive with light to moderate burrowing. Burrows are 1-2 mm diameter, up to 20 mm in length and show random orientation.

80-85 cm: Geotech subsample. Core edge shows light, grainy bed at 80 to 83 cm. Unit appears graded and shows sharp, irregular basal contact. Upper contact is indistinct. Clasts at base of unit are subrounded to subangular and are up to 2 X 3 mm.

85-94 cm: Magnetic subsample. Core edge is massive with widely dispersed clasts up to 2 X 2 mm. Lower 4 cm of interval shows light burrowing. 94-103 cm: Massive with light burrowing. Burrows are 1-2 mm diameter, up to 15 mm in length and show random orientation.

103-107 cm: Geotech subsample. Core edge is massive.

107-109 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation.

109-119 cm: Magnetic subsample. Core edge is massive with faint mottled texture.

119-123 cm: Massive with faint mottled texture.

123-129 cm: Geotech subsample. Core edge is massive with faint mottled texture.

129-134 cm: Faint, laterally discontinuous, whispy laminae 3-10 mm thick throughout interval. Light laminae show grainy texture. Subrounded clast at 130 cm, 4 X 6 mm.

134-142 cm: Magnetic subsample - disturbed.

142-148 cm: Massive with slightly mottled texture. Very light burrowing with 1-2 mm diameter burrows showing random orientation.

148-154 cm: Geotech subsample. Core edge is massive.

154-158 cm: Very faint, latereally discontinuous, whispy laminae 1-3 mm thick throughout interval. 4 subrounded clasts up to 2 X 2 mm over 56.5 to 58 cm.

158-168 cm: Massive or disturbed.

Core CA-6.0

0-8 cm: Removed.

8-24 cm: Massive - disturbed.

24-28 cm: Massive with slightly mottled texture. Subrounded clast at 25 cm, 4 X 8 mm. Subrounded clast at 27 cm, 4 X 8 mm.

28-35 cm: Magnetic subsample - disturbed.

35-42 cm: Geotech subsample. Core edge shows slightly mottled to grainy texture. Subangular clast at 37 cm, 12 X 13 mm.

42-50 cm: Massive with slightly mottled to grainy texture. Subrounded to subangular clasts up to 4 X 9 mm dispersed throughout interval.

50-51.5 cm: Geochem subsample. Core edge is massive.

51.5-54.5 cm: Laterally discontinuous laminae 5-15 mm thick showing grainy texture and indistinct contacts. Subrounded clast at 53 cm, 7 X 9 mm.

54.5-60 cm: Massive with slightly mottled texture.

60-66 cm: Magnetic subsample (?). Core edge shows faint alternating light-dark laminae 1-4 mm thick. Contacts are indistinct. Clasts up to 2 X 4 mm in disturbed area.

66-70 cm: Massive with mottled to slightly grainy texture. Subangular clasts at 68 cm, 4 X 5 mm and 6 X 10 mm.

70-73 cm: Geotech subsample. Core edge shows mottled to slightly grainy texture.

73-75 cm: Massive with mottled to slightly grainy texture.

75-77 cm: Geochem subsample. Core edge shows fine grainy texture.

77-78 cm: Massive with fine grainy texture.

78-80 cm: Magnetic subsample. core edge is massive.

80-82cm: Poorly defined interval showing coarse grainy texture. Subrounded to subangular clasts up to 6 X 7 mm dispersed in interval. Contacts are indistinct.

82-86 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation. Subangular clast at 89 cm, 4 X 8 mm. Subangular clast at 90.5 cm, 6 X 8 mm.

86-95 cm: Graded interval comprised of alternating light-dark laminae which range from < 1 to 4 mm thick. Basal contact is sharp and appears scoured. Upper contact is indistinct. Clasts up to 1.5 mm diameter are present near base of unit. Laminar are well defined in lowed 2 cm of unit and are less distinct in upper portion. Lower 2 cm of unit show well defined cross laminae in trough-shaped sets of up to 1 cm thick.

95-104 cm: Massive with slightly grainy texture.

104-114 cm: Magnetic subsample. Core edge is massive with grainy texture at 104-106 cm. Subrounded clast at 105 cm and 106 cm, 3 X 5 mm and 4 X 5 mm.

114-120 cm: Massive with slight mottled texture. Geochem subsample at 118 cm.

120-123 cm: Poorly defined interval showing coarse grainy texture. Contacts are indistinct. Subangular clast at 123 cm, 1.7 X 3 cm.

123-126 cm: Massive with slightly mottled texture.

126-132 cm: Geotech subsample.

132-138 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation. Subangular clast at 137 cm, 3 X 4 mm.

138-147 cm: Magnetic and geochem subsamples. Core edge is massive and shows coarse grainy texture between 141 and 147 cm.

147-153 cm: Massive with slightly mottled texture. Subangular clast at 149 cm, 2.2 X 4 cm.

153-163 cm: Geotech and geochem subsamples. Core edge is massive. Subrounded clast at 157 cm, 2 X 3 mm. Lower 4 cm of interval shows light burrowing.

163-167 cm: Massive wiht light burrowing. Subrounded clast at 167 cm, 9 X 10 mm. 167-187 cm: Heavily subsampled. Core edge is massive and slightly mottled.

187-190 cm: Whispy, laterally discontinuous, light laminae, 1-10 mm thick. Laminae are poorly defined. Angular, bladed clast at 188 cm, 5 X 20 mm.

190-213 cm: Heavily subsampled. Core edge is massive with light burrowing in upper 5 cm of interval.

213-223 cm: Massive with slight mottled texture. Very poorly defined light interval showing grainy texture at 215 to 218 cm. Subrounded clast at 216 cm, 1.5 X 2 cm.

223-267 cm: Heavily subsampled. Core edge is largely massive. Light burrowing over 223-227 cm. Subangular clast at 234 cm, 1.5 X 3.5cm. Subrounded to subangular clasts up to 3 X 4 mm widely dispersed over 246 to 259 cm.

Core IT-0.1

0-7 cm: Mottled texture - disturbed.

7-14 cm: Mottled texture. Faint, light laminae 2-5 mm thick near base of interval. Laminae appear convolute (disturbed ?).

14-22 cm: Massive with slightly mottled texture.

22-26 cc: Poorly defined convolute light laminae, 7 mm thick.

26-36 cm: Distinctly mottled texture. Possible vertical burrow, 5-7 mm wide and 4 cm in length.

36-38 cm: Faint, nearly planar, alternating light-dark laminae, 1-5 mm thick.

38-41 cm: Massive.

41-46 cm: Distinctly mottled texture.

46-50 cm: Faint, nearly planar, alternating light-dark laminae, 1-5 mm thick. 5 mm thick lamina at 48 cm shows sharp, slightly convolute basal contact. Upper contacy is indistinct.

50-59 cm: Massive with slightly mottled texture.

59-62 cm: Massive.

62-67 cm: Faint, alternating light-dark laminae 3-15 mm thick. Discontinuous dark horizons throughout interval (desication cracks ?).

67-76 cm: Alternating, planar light-dark laminae. Light laminae 1-2 mm thick at 68, 69 and 70 cm. Poorly defined light laminae, 4-10 mm thick at 71.5, 73.5 and 75 cm.

75-77 cm : Mottled texture.

77-82 cm: Massive.

82-94 cm: Poorly defined light beds, 1-2 cm thick at 83, 85, 89 and 91 cm. Minor desication cracks throughout interval.

94-99 cm: Poorly defined regularly alternating light-dark laminae 7-10 mm thick.

99-101.5 cm: Massive.

101.5-112 cm: Alternating light-dark laminae 5-12 mm thick. Lower contacts are planar to slightly convolute and moderately well defined. Upper contacts are indistinct. Light laminae occur at 102, 104, 105.5, 107, 109 and 111 cm.

112-118 cm: Well defined, alternating light-dark laminae, 1-4 mm thick. Laminae are whispy to slightly convolute.

118-121 cm: Poorly defined, alternating light-dark laminae, 3-12 mm thick.

121-127 cm: Moderately well defined, alternating light-dark laminae. Light laminae occur at 122, 124, 125.5 and 126 cm. Light laminae are whispy - discontinuous to slightly convolute and are 2-4 mm thick.

127-129.5 cm: Massive.

129.5-131 cm: Very faint, alternating light-dark laminae, 1-3 mm thick.

131-132 cm: Moderately well defined light lamima, 1 cm thick. Basal contact is well defined and slightly convolute (disturbed ?).

132-136 cm: Massive.

136-139 cm: Regularly alternating, well defined light-dark laminae, 1-3 mm thick. Laminae are slightly convolute.

139-142 cm: Massive.

142-144 cm: Faint, alternating light-dark, slightly convolute laminae, 1-3 mm thick.

142-144 cm: Faint, discontinuous light laminae, 1-2 mm thick.

144-145 cm: Poorly defined light laminae up to 10 mm thick. Contacts are indistinct.

145-148 cm: Very faint light laminae, 1-5 mm thick.

148-150 cm: Faint, whispy to slightly convolute light laminae, 1-3 mm thick.

150-151 cm: Poorly defined light bed, 1 cm thick. Contacts are indistinct.

151-156 cm: Massive with very faint light laminae up to 10 mm thick.

156-158 cm: Moderately well defined, planar, alternating light-dark laminae, 1-4 mm thick.

158-164 cm: Massive with very faint laminae up to 10 mm thick.

164-165.5 cm: Whispy, discontinuous light laminae 1-3 mm thick.

165.5-169.5 cm: Poorly defined, alternating light-dark, planar laminae, 7-10 mm thick. Contacts are indistinct. Lowermost light bed is 1.7 cm thick.

169.5-172 cm: Very poorly defined whispy laminae up to 2 mm thick. Laminae are discontinuous.

172-173 cm: Alternating light-dark, planar laminae, 1-3 mm thick.

173-176 cm: Light interval with 1-2 mm thick, planar dark laminae at 174, 175 and 175.5 cm.

176-178.5 cm: Dark interval with two light laminae at 176.5 and 177.5. Light laminae are 5-7 mm thick and are well defined and planar at core edges becoming poorly defined and irregular at core center.

178.5-179.5 cm: Light lamina 1cm thick. Upper and lower contacts where distinct appear convolute.

179.5-180 cm: Faint dark laminae, 5 mm thick.

180-185 cm: Massive with very faint dark laminae at 182, 183 and 184.5 cm.

185-189 cm: Planar to slightly whispy, alternating light-dark laminae, 1-4 mm thick.Light laminae are faint with poorly defined contacts.

189-192 cm: Massive.

192-197 cm: Faint, alternating light-dark laminae, 1-2 mm thick. Laminae appear inclined at 20 - 30° across core width.

197-198 cm: Poorly defined light bed, 1 cm thick. Contacts are indistinct.

198-200 cm: Dark interval with light laminae 2-3 mm thick at 199 and 19.5 cm. Where distinct, laminae appear slightly convolute.

200-205 cm: Massive.

205-205.7 cm: Planardark lamina,7mm thick. Contacts are indistinct.

205.7-206.2 cm: Poorly defined, planar light laminae, 5 mm thick. Light laminae shows grainy texture and indistinct contacts.

206.2-209 cm: Massive with very faint light laminae at 208.5 cm.

209-209.5 cm: Dark lamina 3-5 mm thick. Basal contact is well defined and is comprised of linked "concave-up" segments. Upper contact is indistinct.

209.5-210.5 cm: Planar light bed, 1 cm thick. Upper contact is well defined.

Lower contact is indistinct and slightly convolute.

210-212.5 cm: Massive.

212.5-213 cm: Dark laminae 2-10 mm thick showing grainy texture. Basal contact is sharp and planar. Upper contact is indistinct.

213-213.5 cm: Light laminae 5-6 mm thick. Upper contact is sharp and slightly convolute. Basal contact is indistinct.

213.5-218 cm: Massive.

218-220 cm: Very faint alternating light-dark laminae, 3-6 mm thick.

220-221 cm: Light lamina showing very sharp, planar basal contact and indistinct upper contact. Lamina is up to 10 mm thick.

221-222.5 cm: Massive light bed 1.5 cm thick showing sharp upper and lower contacts.

222.5-225 cm: Massive.

Core IT-0.3

0-2 cm: Disturbed. Pelecypod at surface.

2-7 cm: Massive with slight mottled texture.

7-9 cm: Geochem subsample. Core edge is massive with slight mottled texture. Pelecypod at 8 cm.

9-13 cm: Massive with slight mottled texture.

13-15 cm: Geochem subsample. core edge shows slightly convolute light lamina, 3-9 mm thick. Contacts are poorly defined.

15-17 cm: Massive with slight mottled texture.

17-20 cm: Geochem subsample. Core edge is massive with slight mottled texture.

20-29 cm: Massive with slight mottled texture. Geochem subsamples at 24 and 28 cm.

29-32 cm: Interval shows fine grainy texture and poorly defined light laminae. 2-4 mm thick.

32-40 cm: Massive.

40-42 cm: Very faint light laminae <3 mm thick showing indistinct contacts.

42-44 cm: Geochem subsample. Core edge is massive.

44-46 cm: Faint, laterally discontinuous, whispy light laminae <2 mm thick.

46-49 cm: Graded light bed with coarse grainy texture in lower 1 cm of interval. Very faint, subhorizontal laminae <2 mm thick in center of unit. Basal contact is sharp. Upper contact is indistinct with sharp portions.Geochem subsample at 49 cm.

49-55 cm: Massive with faint burrowing. Burrows are 1-2 mm diameter and show a preference for horizontal alignment. Geochem subsample at 54 cm.

55-59 cm: Massive. Subangular clasts up to 2 X 4 mm dispersed over 57-58 cm.

59-60 cm : Faint, slightly convolute, light lamina up to 10 mm thick. Contacts are indistinct. Geochem subsample at 59 cm.

60-67 cm: Massive with slightly grainy texture over 62-64 cm. Geochem subsample at 64 cm.

67-71 cm: Alternating light-dark laminae 1-4 mm thick throughout interval. Faint cross laminae in upper portion of unit comprise sets of up to 2 cm thick. Contacts are indistinct. Geochem subsample at 69 cm.

71-74 cm: Massive with slight mottled texture. Geochem subsample at 74 cm.

74-78 cm: Alternating light-dark laminae 1-2 mm thick throughout interval. Uppermost 1.5 cm of interval show faint cross laminae. Unit shows sharp basal contact and indistinct upper contact.

78-87 cm: Massive with very light burrowing. Clasts up to 3 X 3 mm are widely dispersed throughout interval. Geochem subsamples at 80, 83 and 86 cm.

87-89 cm: Very faint light interval showing mottled (burrowed ?) texture. Contacts are indistinct.

89-97 cm: Massive with very light burrowing. Faint light lamina at 92 cm, 5 cm thick. Lamina shows indistinct contacts. Coarse grainy texture over 94-96 cm with subrounded clasts up to 3 X 3 mm.

97-100 cm: Massive with very light burrowing. Geochem subsample at 98 cm. Subangular clast at 98 cm, 5 X 10 mm.

100-106 cm: Massive with subrounded clast at 105.5 cc, 3 X 4 mm. Geochem subsample at 104 cm.

106-114 cm: Massive with moderate burrowing. Burrows are 1-3 mm diameter, up to 7 cm in length and show a strong preference for horizontal alignment. Geochem subsample at 114 cm.

114-118 cm: Interval shows widely dispersed subangular to subrounded clasts up to 4 X 9 mm.

118-121 cm: Massive with light burrowing. Burrows are 1-2 mm diameter, up to 5 cm in length and show random orientation.

121-122 cm: Faint light lamina, 9 mm thick. Contacts are indistinct.

122-124 cm: Massive.

Faint light lamina, 9 mm thick. Contacts are indistinct. Geochem subsample at 125 cm.

125-128 cm: Massive.

128-129 cm: Dispersed subrounded clasts over interval up to 4 X 5 mm.

129-139 cm: Massive. Burrow 3 mm diameter and 20 mm in length at 130 cm. Subrounded clast at 130 cm, 6 X 7 mm. Subangular clast at 131 cm, 4 X 10 mm. Subangular clast at 132 cm, 6 X 15 mm. Faint, light lamina, 3-4 mm thick at 136 cm showing indistinct contacts. Geochem subsample at 136 cm.

139-140 cm: Faint, light horizon showing coarse grainy texture. Contacts are indistinct. Clasts are subrounded to subangular and are up to 5 X 8 mm.

140-143 cm: Massive or disturbed.

Core IT-0.4

0-101 cm: Highly disturbed by geochem subsampling.

0-5 cm: Disturbed light interval. Geochem subsamples at 2 and 5 cm.

5-24 cm: Massive. Faint light bed at 11-13 cm showing slight grainy texture. Contacts are indistinct. Geochem subsamples at 9, 14, 18 and 23 cm.

24-26 cm: Dark bed showing grainy texture and faint, laterally discontinuous, whispy to irregular light laminae, 2-5 mm thick. Contacts range from sharp and irregular to indistinct.

26-33 cm: Massive with very light burrowing. Burrows are <1-2 mm diameter and show random orientation. Geochem subsample at 28 cm.

33-37 cm: Dark bed showing grainy to mottled texture. Contacts are indistinct. Geochem subsample at 35 cm.

37-57 cm: Massive. Disturbed light lamina at 41 cm up to 10 mm thick showing slight grainy texture. Contacts are indistinct. Pelecypod at 42 cm. Geochem subsamples at 42, 45, 50 and 55 cm.

57-59 cm: Very irregular, laterally discontinuous dark laminae, 1-12 mm thick.

59-61 cm: Massive. Geochem subsample at 61 cm.

61-66 cm: Faint dark bed 5 cm thick with whispy, light laminae 2-3 mm thick in upper 1 cm of bed. Lower contact is sharp and irregular. Upper contact is indistinct.

66-71 cm: Massive light interval. Geochem subsamples at 68 and 71 cm.

71-130 cm: Massive. Subangular clasts up to 8 X 8 mm dispersed over 76-77 cm. Pelecypod at 79 cm. Subrounded clasts up to 8 X 12 mm dispersed over 80.5-82 cm. Subangular clast at 91 cm, 6 X 7 mm. Angular to subrounded clasts up to 6 X 13 mm widely dispersed over 93-100 cm. Very light burrowing over 101-103 cm. Pelecypod at 93 cm. Poorly defined dark interval at 104-109 cm. Subrounded clast at 106.5 cm, 21 X 30 mm. Subangular clast at 108 cm 10 X 11 mm. Pelecypod at 110 cm. Subangular to subrounded clasts up to 5 X 6 mm widely dispersed over 109-119 cm. Angular to subrounded clasts up to 11 X 17 mm concentrated over 119-123 cm. Pelecypod at 120 cm. Whispy, light lamina 5-11 mm thick at 125 cm. Contacts are moderately well defined and slightly irregular.

125-135 cm: Massive.

135-140 cm: Massive, dark interval showing coarse grainy texture. Upper contact is moderately well defined and slightly irregular. Subrounded clast at 138 cm, 12 X 13 mm.

Core IT-1.2

0-22 cm: Massive with mottled texture. Light burrowing over interval with 1-3 mm diameter burrows showing random orientation. 1-3 mm shows slight grainy texture. Very faint light lamima at 5 cm, 1-2 mm thick. Desication crack (?) at 17 cm with two subangular clasts, 5 X 10 mm and 8 X 10 mm.

22-41 cm: Massive with slight mottled texture. Subrounded clast at 24 cm, 3 X 3 mm. Subangular clast at 27 cm, 9 X 10 mm. Subangular clast at 35 cm, 18 X 22 mm. Subangular clast at 38 cm, 18 X 22 mm. Subrounded clast at 41 cm, 4 X 8 mm. Pelecypod at 38 cm. Interval between 33 and 36 cm shows grainy texture. Contacts are indistinct. Burrow at 32 cm, 3 mm diameter and 6 cm in length shows diagonal orientation.

41-61 cm: Massive with slight mottled texture. Subrounded clast at 42 cm, 24 X 45 mm. Grainy texture over 47-51 cm. Contacts are indistinct. Subrounded clast at 59 cm, 8 X 9 mm.

61-81 cm: Massive with slight mottled texture. Very faint, poorly defined dark laminae at 66, 69-72 and 79 cm, 1-1.5 mm thick. Two subangular clasts at 66 cm, 2 X 4 mm. Subrounded clast at 67 cm, 9 X 11 mm. Subrounded clast at 75 cm, 8 X 12 mm.

81-90 cm: Massive.

90-91 cm: Poorly defined dark bed 1-1.5 cm thick. Bed contains two subrounded clasts, 3 X 3 mm and 3 X 4 mm.

91-93 cm: Massive light interval.

93-95 cm: Faint dark interval.

95-106 cm: Massive.

106-107 cm: Slightly convolute light lamina, 7-10 mm thick. Lamina shows grainy texture and indistinct contacts.

107-109 cm: Massive.

109-110 cm: Faint light lamina with indistinct contacts, 7-10 mm thick.

110-113 cm: Massive.

113-115 cm: Faint, alternating light-dark, planar laminae, 2-4 mm thick. Contacts are indistinct.

Core IT-2.2

0-5 cm: Faint, whispy light laminae. Where well defined, laminae are 1-2 mm thick.

5-14 cm: Magnetic subsample. Core edge is massive with slight mottled texture.

14-24 cm: Massive with slight mottled texture. Angular to subangular clasts up to 10 X 12 mm widely dispersed throughout. Very irregular light "pod" showing slight grainy texture at 17 cm. "Pod" is 22 X 45 mm.

24-28 cm: Geotech subsample. Core edge shows grainy texture.

28-30 cm: Massive with mottled texture.

30-40 cm: Magnetic subsample. Core edge is massive with very light burrowing. Subrounded clasts up to 12 X 13 mm dispersed throughout.

40-46 cm: Massive with slight mottled texture. Subangular to subrounded clasts up to 12 X 16 mm dispersed throughout. Burrow at 40 cm, 3 mm diameter and 22 mm in length.

46-52 cm: Geotech subsample.

52-55 cm: Massive with slight mottled texture. Subrounded clasts up to 4 X 6 mm widely dispersed throughout.

55-62 cm: Magnetic subsample. Core edge is massive with slight mottled texture. Light bed at 60 cm, 1.2-1.8 cm thick showing grainy texture. Contacts are indistinct.

62-64.5 cm: Massive with slight mottled texture.

64.5-66 cm: Graded light bed 12-21 mm thick showing grainy texture. Lower contact is moderately sharp. Upper contact is indistinct to irregular.

66-69 cm: Massive with slight mottled texture.

69-72 cm: Geotech subsample. Core edge shows grainy texture. Contacts are indistinct.

72-76 cm: Subrounded clasts up to 12 X 15 mm concentrated throughout interval.

76-81 cm: Massive with subrounded to subangular clasts up to 3 X 8 mm widely dispersed throughout. Whispy, laterally discontinouos light laminae 1-3 mm thick over 76-78 cm.

81-89 cm: Magnetic subsample. Core edge is massive.

89-91 cm: Graded light bed 2 cm thick showing grainy texture. Lower contact is sharp and irregular. Upper contact is indistinct.

91-100 cm: Massive with slight mottled texture. Subangular to subrounded clasts up to 6 X 8 mm widely dispersed throughout.

100-115 cm: Magnetic and geotech subsamples. Core edge is massive with subrounded clasts up to 2 X 3 mm widely dispersed throughout.

115-213 cm: Massive with mottled texture. Subangular to subrounded clasts up to 15 X 24 mm widely dispersed throughout interval. Magnetic subsamples at 125-133, 154-164 and 183-191 cm. Geotech subsamples at 149-154 and 200-206 cm. Core edge at 200-206 cm shows grainy texture.

Core IT-2.3

0-3 cm: Geotech subsample.

3-9 cm: Massive with slight grainy texture over 9-16 cm.

9-20 cm: Magnetic subsample. Core edge shows very faint light laminae 2-12 mm thick showing grainy texture. Contacts are indistinct. Core edge over 16-20 cm is massive with slight mottled texture. Subangular clast at 17 cm, 3 X 6 mm.

20-36 cm: Massive with mottled texture. Angular to subrounded clasts up to 12 X 14 mm dispersed throughout. Whispy, light laminae, 1-2 mm thick over 21-23 cm. Laminae show grainy texture and indistinct contacts. Irregular "pod" of angular to subrounded clasts up to 5 X 14 mm at 28 cm. "Pod" is 10 X 14 mm.

36-40 cm: Geotech subsample. Core edge is massive with mottled to slight grainy texture.

40-46 cm: Massive with mottled to slight grainy texture.

46-56 cm: Magnetic subsample. Core edge is massive with mottled to slightly grainy texture. Upper 3 cm of interval shows very light burrowing.

56-70 cm: Massive with mottled to slight grainy texture. Subangular clast at 64 cm, 4 X 6 mm. Subrounded clast at 66 cm, 4 X 5 mm.

70-74 cm: Geotech subsample. Core edge over 70-72 cm shows mottled to slight grainy texture. Core edge over 72-74 cm is massive.

74-80 cm: Massive with slight grainy texture.

80-88 cm: Magnetic subsample. Core edge is massive with grainy to slight mottled texture.

88-94 cm: Light interval showing coarse grainy texture over 90-92 cm. Upper and lower 2 cm of interval show mottled texture. Contacts are indistinct.

94-99 cm: Massive with mottled texture. Faint light lamina 3-5 mm thick at 99 cm. Contacts are indistinct.

99-109 cm: Massive with mottled to slight grainy texture.

109-113 cm: Massive with mottled to coarse grainy texture.

113-118 cm: Geotech subsample. Core edge shows mottled texture with irregular light patches.

118-122 cm: Massive with grainy texture and indistinct light laminae 1-3mm thick.

122-132 cm: Magnetic subsample. Core edge over 122-127 is massive with grainy texture and indistinct, whispy light laminae 3-15 mm thick. Core edge over 127-132 cm is massive with mottled to slight grainy texture.

132-143 cm: Massive with mottled to slight grainy texture. Subrounded clasts up to 5 X 9 mm widely dispersed throughout interval.

143-152 cm: Massive with slight mottled texture and light burrowing. Burrows are 1-3 mm diameter and show random orientation.

152-160 cm: Geotech subsample. Core edge is massive and shows mottled to slight grainy texture.

160-167 cm: Magnetic subsample. Core edge is massive.

167-179 cm: massive with slight mottled texture and moderate burrowing. Burrows are 1-2 mm diameter and show random orientation.

179-184 cm: Well defined light interval showing faint, whispy light laminae 1-3mm thick over 179-181 cm and well defined 1-2 mm thick alternating light-dark laminae over 181-183 cm. The well defined light laminae show inclinations ranging from 0-30°. The lower 1 cm of the interval is massive and shows grainy texture. Basal contact is sharp and planar. upper contact is indistinct. Unit appears graded.

194-190 cm: Massive with mottled to slight grainy texture. 184-186 cm shows faint, whispy light laminae 1-12 mm thick. Subrounded clast at 185 cm, 3 X 3 mm.

190-193 cm: Geotech subsample. Core edge shows light bed at 190-192 cm with coarse grainy texture. Lower contact is sharp and irregular. Upper contact is indistinct. Unit appears graded.

193-198 cm: Massive with irregular, elongate light patches up to 8 mm in width and 3 cm in length which show grainy texture. Light patches show a slight preference for vertical alignment.

198-208 cm: Magnetic subsample. Core edge is massive. Subangular clast at 200 cm, 5 X 8mm. Elongate, curved light patch at 201 cm showing grainy texture, 8 X 22 mm. Two subrounded clasts at 208 cm, 5 X 6 mm and 8 X 17 cm.

208-212 cm: Massive with subrounded clasts up to 2 X 3 mm widely dispersed throughout interval.

212-229 cm: Geotech and magnetic subsample. Core edge is massive with subrounded to subangular clasts up to 5 X 6 mm widely dispersed throughout interval.

Core IT-3.1

0-6 cm: Disturbed.

6-12 cm: Massive with subrounded to subangular clasts up to 10 X 11 mm dispersed throughout interval.

12-15 cm: Dark horizon showiwng indistinct contacts. Geochem subsample at 14 cm.

15-36 cm: Massive with slight mottled texture. Subrounded clasts up to 2 X 3 mm widely dispersed throughout upper 5 cm of interval.

36-54 cm: Massive with light burrowing. Burrows are 1-2 mm diameter, up to 2 cm in length and show random orientation. Subrounded clast at 37 cm, 7 X 8 mm. Laterally discontinuous, whispy light laminae showing slight grainy texture at 36.5 and 39 cm. Laminae are 1-8 mm thick. Burrow at 45 cm, 4 X 26 mm. Dark bed at 46-48 cm showing distinct planar upper and lower contacts. Unit is inclined at 18° (split surface feature ?).

55-57 cm: Dark interval showing slight grainy texture and indistinct contacts.

57-62 cm: Massive. Geochem subsample at 60 cm.

60-90 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show slight preference for horizontal alignment. Vertical burrow (?) 62-69 cm, 6 mm diameter.Irregular "pod" showing grainy texture at 64 cm, 2 X 3 cm. "pod" contains subrounded clasts up to 5 X 6 mm. Angular clast at 74 cm, 25 X 28 mm. Irregular "pod" showing coarse grainy texture at 85 cm, 2 X 2 cm.

"pod" contains subrounded clasts up to 4 X 6 mm. Geochem subsamples at 71 and 83 cm.

90-103 cm: Massive with slightly mottled texture. Geochem subsamples at 92 and 101 cm.

103-108 cm: Whispy, alternating light-dark laminae 1-4 mm thick showing grainy texture. Contacts are indistinct.

108-124 cm: Massive with mottled texture. Geochem subsamples at 101 and 123 cm.

124-132 cm: Massive with very faint light laminae at 126 and 128 cm. Laminae are 2-5 mm thick. Contacts are indistinct. Geochem subsample at 131 cm.

132-133 cm: Well defined bed up to 1.5 cm thick showing grainy texture. Basal contact is sharp and is comprised of concave-up segments. Upper contact is indistinct.

133-145 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation.

145-146 cm: Welldefined bed up to 1.2 cm thick showing grainy texture. Upper and lower contacts are indistinct.

146-154 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation.

154-162 cm: Very faint light laminae 1-4 mm thick showing slight grainy texture. Laminae are steeply inclined (up to 35°.

162-184 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation. Faint, whispy, laterally discontinuous light laminae 1-3 mm thick at 170-173 cm. Laminae show slight grainy texture. Geochem subsample at 164, 172 and 184 cm.

184-191 cm: Massive with moderate to heavy burrowing. Burrows are 1-2 mm diameter and show random orientation.

191-246 cm: Massive with slight mottled texture and light burrowing. Subrounded clast at 201 cm, 12 X 18 mm. Angular clast at 208 cm, 5 X 10 mm. Geochem subsamples at 203, 211, 223, 232 and 244 cm.

Core MC-0.1

0-11 cm: Massive with slight mottled texture. Pelecypod at 1 cm. Subrounded to subangular clasts up to 15 X 18 mm widely dispersed throughout.

11-15 cm: Massive with subangular to subrounded clasts up to 8 X 15 mm concentrated throughout interval.

15-21 cm: Massive with subangular to subrounded clasts up to 8 X 15 mm widely dispersed throughout.

21-30 cm: Massive with subangular to subrounded clasts up to 9 X 18 mm concentrated throughout interval. Irregular dark area 8 X 9 cm (large clast imprint ?) at 21 cm. Geochem subsample at 21 cm.

30-37 cm: Massive with angular to subrounded clasts up to 15 X 19 mm dispersed throughout. Clasts comprise an irregular "pod" at 35 cm, 17 X 35 mm.

37-43 cm: Poorly defined light laminae-beds up to 2 cm thick showing grainy texture. Contacts are indistinct. Angular to subangular clasts up to 3 X 5 mm dispersed over 40-42 cm. Geochem subsample at 41 cm.

43-104 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation. Subrounded to subangular clasts up to 10 X 16 mm widely dispersed throughout interval. Geochem subsamples at 50, 62, 71, 81 and 94 cm.

104-106 cm: Whispy, alternating light-dark laminae 2-6 mm thick showing grainy texture. Lower 2 cm of interval shows coarse grainy texture. 98-100 cm shows faint cross laminae comprising sets of up to 2 cm thick. Basal and upper contacts are sharp and irregular. Geochem subsample at 101 cm.

106-179 cm: massive with moderate burrowing. Burrows are 1-2 mm diameter and show random orientation. Subangular to subrounded clasts up to 2 X 3 mm very widely dispersed over 102-135 cm. Very faint light lamina at 163 cm showing grainy texture. Lamina is 1-3 mm thick and is laterally discontinuous. Pelecypod at 163 cm. Geochem subsamples at 112, 122, 128, 142, 152, 161 and 170 cm.

179-221 cm: Massive with mottled texture. Very faint light bed at 188 cm showing faint grainy texture. Bed is 2 cm thick and shows indistinct contacts. Light lamina at 201 cm, 1.5 mm thick showing slight grainy texture. Basal contact is sharp. Upper contact is indistinct. Geochem subsamples at 182, 192, 201, 211 and 219 cm.

Core MC-2.0

0-3 cm: Massive. Geochem subsample at 2 cm.

2-6 cm: 3 cm thick dark bed showing faint, whispy light laminae 1-4 mm thick.

6-17 cm: Massive with subrounded to angular clasts up to 9 X 12 mm widely dispersed throughout. Geochem subsample at 9 and 16 cm.

17-30 cm: Massive with subrounded to angular clasts up to 23 X 20 mm dispersed throughout. Irregular "pod" of coarse clasts up to 20 X 23 mm at 26 cm. "pod" is 2.5 X 5 cm. Geochem subsample at 25 cm.

30-35 cm: Massive with subrounded to angular clasts up to 8 X 13 mm concentrated throughout interval. Geochem subsample at 35 mm.

35-53 cm: Massive with slight mottled texture. Subrounded to angular clasts up to 9 X 15 mm dispersed throughout. Geochem subsample at 47 cm.

53-88 cm: Massive with mottled texture. Subrounded to angular clasts up to 15 X 24 mm widely dispersed throughout. 77-78 cm shows light burrowing. Burrows are 1-3 mm diameter and show random orientation. Geochem subsamples at 56, 65, 77 and 87 cm.

88-110 cm: Massive with slight mottled texture and light to moderate burrowing. Burrows are 1-3 mm diameter and show random orientation.Geochem subsample at 98 and 109 cm.

110-121 cm: Massive with slight mottled texture and very light burrowing. Geochem subsample at 119 cm.

121-144 cm. Massive with slight mottled texture and light to moderate burrowing. Burrows are 1-3 mm diameter and show random orientation. Geochem subsample at 129 and 138 cm.

144-155 cm: Massive showing pronounced mottled texture. Irregular, elongate patches showing grainy texture at 145 and 155 cm, 5 X 30 mm and 4 X 22 mm respectively. Geochem subsamples at 147 and 157 cm.

155-237 cm: Massive with slight mottled texture and light to moderate burrowing. Burrows are 1-3 mm diameter and show random orientation. Interval over 169-175 cm shows pronounced mottled texture. Faint light bed at 208-210 cm with indistinct contacts. Geochem subsamples at 168, 180, 190, 199, 211, 222 and 230 cm.

237-241 cm: Planar, alternating light-dark laminae, 1-8 mm thick. Upper contact is indistinct. Lower contact is not present.

Core MC-2.1

0-8 cm: Disturbed.

8-47 cm: Massive with slight mottled texture. Burrow at 22 cm, 3-8 mm diameter and 7 cm in length. Subrounded clast at 21 cm, 11 X 12 cm. Interval between 31 and 36 cm shows widely dispersed subrounded to subangular clasts up to 9 X 13 mm. Geochem subsamples at 10, 16, 27, 35 and 44 cm.

47-55 cm: Massive with mottled texture and very faint light laminae 1-18 mm thick along core edge.

55-67 cm: Massive with slight mottled texture. Subrounded clast at 58 cm, 3 X 5 mm. Subrounded clast at 64 cm, 5 X 7 mm. Geochem subsamples at 58 and 66 cm.

66-76 cm: Massive with widely dispersed subrounded to subangular clasts up to 25 X 30 mm dispersed throughout. Interval over 70-73 cm shows laterally discontinuous, light laminae 2-4 mm thick. Laminae are well defined and show distinct upper and basal contacts along core edge. Geochem subsamples at 66 and 74 cm.

76-86 cm: Massive with slight mottled texture. Geochem subsample at 84 cm.

86-92 cm: Massive with light burrowing. Burrows are 1-4 mm diameter, up to 4 cm in length and show slight preference for vertical orientation.

92-250 cm: Massive with widely dispersed subrounded to subangular clasts up to 15 X 15 mm widely dispersed throughout. Angular clast at 117 cm, 42 X 15 mm. Subrounded clast at 121 cm, 30 X 32 mm. Interval over 208-213 cm shows light burrowing. Burrows are 1-3 mm diameter, up to 3 cm in length and show slight preference for vertical alignment. Geochem subsamples at 94, 101, 110, 117, 133, 140, 152, 163, 173, 185, 195, 204, 215, 228 and 237 cm.

Core MC-4.1

0-3 cm: Geotech subsample.

3-4 cm: Disturbed.

4-5 cm: Dark bed 10-15 mm thick showing slightly grainy texture and sharp, planar upper and lower contacts.

5-10 cm: Massive with slight mottled texture. Angular clast at 9 cm, 10 X 16 mm.

10-12 cm: Slightly darker bed 20 mm thick showing grainy texture. Upper contact is moderately distinct and irregular. Basal contact is indistinct. Whispy, laterally discontinuous light laminae at 11 and 12 cm, 1-3 mm thick.

12-15 cm: Massive.

15-19 cm: Geotech subsample. Core edge shows dark bed 35 mm thick with coarse grainy texture. Upper and lower contacts are sharp and irregular.

19-21 cm: Massive.

21-25 cm: Irregular light interval showing grainy texture and indistinct contacts.

25-36 cm: Core disturbed.

36-43 cm: Magnetic subsample. Core edge is massive with mottled texture.

43-46.5 cm: Massive with slight mottled texture.

46.5-51 cm: Geotech subsample. Core edge is massive wit slight mottled texture.

51-52 cm: Massive.

52-53 cm: Dark bed 1 cm thick showing moderately distinct, planar contacts.

53-64 cm: Massive with slight mottled texture. Subrounded clast at 58 cm, 4 X 7 mm. Poorly defined dark bed at 59-61 cm showing slight grainy texture.

64-74 cm: Magnetic subsample. Core edge is massive with slight mottled texture.

74-81 cm: Massive with slight mottled texture.

81-86.5 cm: Geotech subsample. Core edge shows dark bed at 83 cm, 1.5 cm thick. Dark bed shows grainy texture and indistinct contacts.

86.5-90 cm: Massive.

90-103 cm: Magnetic subsample. Core edge is massive with slight mottled texture. Very faint, light lamina at 91 cm, 7-10 mm thick. Contacts are indistinct. Subrounded clast at 97 cm, 5 X 8 mm.

103-104.5 cm: Massive dark bed 1.5 cm thick showing mottled texture and poorly defined contacts.

104.5-105 cm: Faint light lamina 5 mm thick. Contacts are poorly defined and planar.

105-106 cm: Faint dark bed 1 cm thick. Contacts are poorly defined and planar.

106-106.7 cm: Very faint light lamina 7 mm thick. Contacts are poorly defined and planar.

106.7-112 cm: Massive with slight mottled texture. Subrounded clast at 109 cm, 3 X 5 mm.

112-120 cm: Magnetic subsample. Core edge is massive with slight mottled texture and shows very light burrowing.

120-124 cm: Massive.

124-129 cm: Geotech subsample. Core edge is massive.

129-146 cm: Massive with very light burrowing. Burrows are 1-2 mm diameter and show random orientation. Very faint light bed at 142 cm, 2 cm thick. Contacts are indistinct.

146-155 cm: Magnetic subsample. Core edge is massive.

155-158 cm: Massive.

158-163 cm: Geotech subsample. Core edge is massive.

163-173 cm: Massive with slight mottled texture and light burrowing. Faint dark laminae at 170.5 and 172 cm, 4 and 15 mm thick respectively. Contacts are poorly defined and indistinct.

173-183 cm: Magnetic subsample. Core edge is massive with slight mottled texture and shows grainy textureover lower 3 cm of interval.

183-187 cm: Massive with very faint dark bed 1.5 cm thick at 185 cm. Interval shows slight grainy texture. Subrounded clast at 187 cm, 4 X 5 mm.

187-193 cm: Geotech subsample. Core edge is massive with slight mottled texture.

193-197 cm: Massive with light burrowing. Burrows are 1-2 mm diameter and show random orientation.

197-206 cm: Massive with slight mottled texture.

206-223 cm: Magnetic and geotech subsamples. Core edge is massive with slight mottled texture.

223-233 cm: Massive with slight mottled texture. Subrounded clast at 229 cm, 4 X 5 mm. Subrounded clast at 232 cm, 4 X 5 mm.

12. Side-Entry Systems : inputs to the fiords from their margins

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Cruise objectives:

a) To assess the influence of sediment derived from fiord margins on the disposition of the major sediment masses and the character of resultant sediments.

b) To assess the change in marginal input resulting from late Quaternary environmental change.

Methods

Geomorphological maps of Cambridge (fig. 1), Itirbilung (fig. 2) and Pangnirtung fiords were prepared from air photographs prior to the cruise. Those of Cambridge and Itirbilung were amended during the cruise, and a map of McBeth (fig. 3) prepared after the cruise. They were intended to show the major side entries, but also show the major geomorphological and sedimentary features which reflect modern and late Quaternary surface processes. They are plotted to the same scale as the air photographs (1:63,690), and terrestrial contours have been added from 1:125,000 maps produced by the Department of Energy, Mines and Resources.

Echo sounder traverses by the cruise hydrographer M.Lamplugh, were used to produce the contoured bathymetry on these maps.

The BIO sidescane traverses and Huntec Deep Tow profiles in Itirbilung fiord and McBeth fiord were interpreted during the cruise. Interpretations of the sidescan data away from fiord heads has been plotted onto figures 2 and 3.

Interpretations of the Huntec profiles have also been drawn up on these figures.

Four principal seismic textures were distinguished: a strong reflection from a surface through which there is little penetration of seismic energy, and which we presume to be bedrock; a typically incoherent texture which we presume to be glacial till; a texture composed of many small curved and parabolic reflectors which we believe to represent debris-flow masses, for reasons given below; and a laminated texture, which we have not attempted to subdivide, which represents sediment which is not till and not debris-flow, in which the laminae reflect the gross disposition of internal bedding. When profiling close to fjord walls, strong side reflections are commonly recorded. In some cases it is difficult to distinguish these from echos beneath the ship. Although this can be done by comparing the seismic trace with bathymetry, we have not yet removed some of the side-echo peaks from the interpretation.

The bathymetry in figures 1 and 3 has been used to compute slope maps of parts of the fiords (figs. 4-7).

Some aspects of glacial history

In Cambridge Fiord, major moraines produced at former ice margins of a large Cambridge fiord glacier are common in the inner Fiord. The maximum extent and age of this glacier cannot yet be assessed. A major standstill phase occurred when the ice margin lay at the sill at 74°45'W 71°18'N; and a continuous sequence of ice contact features reflect glacier retreat from the western, abandoned delta at the head of Cambridge Fiord and into the mountains to the north-west.

Terminal moraines descending into Omega Bay (74°50'N 71°27'N) probably reflect a standstill contemporary with that of the moraines which occur near the main Cambridge Fiord sill.

In the case of Itirbilung and McBeth Fiords, it is particularly useful to compare the terrestrial evidence of former glacier expansion with that derived from seismic profiling. A major series of moraines produced by a former glacier flowing east along the axis of Itirbilung fiord are found near the fiord mouth on the south side, and particularly on the north side around a broad embayment (lat. 69°19' long 68°10'). These represent limits of glacier expansion or major halts during retreat. Moraines reflecting a former glacial stillstand within this embayment correlate well with our interpretation of a large ice-contact face and major till masses between fixes 22 and 23; whilst moraines further east (68°E) may correlate with inferred large till masses between fixes 16 and 18. We also see evidence of major fiord floor till masses between fixes 24 and 27 which probably reflect glacier stillstands and which correlate with the masses noted by Gilbert and MacLean (1983) which they attribute to minor readvances of a glacier. This phase left no clear evidence on land.

In McBeth Fiord, large moraine systems occur in the southern flank of the inner fiord and appear to reflect former glacier flow from the north-west. They are cut by modern glaciers and clearly reflect a quite different climatic regime. It is possible that the major till mass which we infer between fixes 64 and 65 in the seismic record correlates with the terrestrial moraines, indicating that the glacier terminated against a large sill. Further, the major west-facing scarp at fix 64 may largely be an ice-contact front, analogous to that at fix 23 in Itirbilung fiord. The disturbance to its west may largely reflect collapse of this scarp.

Side entry-systems

The sedimentary role of fiord margins is to introduce new sediment into the fiord system and secondly because of the steep marginal slopes (figs. 4-6) to cause sediments temporarily and unstably stored on these submarine flanks to be remobilised and move towards the fiord axis.

i. Primary fiord-side sediment inputs

The principal primary side inputs into these fiords are from alluvial fan-deltas, which are normally glacier-fed, calving glacier fronts, and fiord-size talus cones. Near the mouth of McBeth Fiord (68°42'N, 68°39'N) is the only large braided side-entry fluvial system to feed any of the three fiords.

Evidence of former side inputs during periods of glacio-isostatically increased sea level are few. Good examples occur in McBeth Fiord, particularly on the south side, and in Omega Bay on the west side of Cambridge Fiord (74°56'W, 71°27'N). No examples were seen on the steep-sided flanks of Itirbilung Fiord. In most cases, evidence of earlier side entry systems related to higher sea levels has probably been removed by erosion in the narrow side entry valleys.

Good examples of larger side entry fans occur on the south shore of the inner McBeth Fiord at 69°53'W, 68°31'N. An antecedant of these fan delta composed of extremely coarse blocks marks a marine limit and is probably related to deglaciation from the moraines which lie to the south. Derived from the modern fan deltas are prominent debris flows on the southern flank of the fiord (fig. 3) which are very clearly shown on the sidescan record. Seismic profiles over these flows show characteristic masses of small parabolic reflectors (fig. 3). Such seismic signatures are common, both in the McBeth and Itirbilung Fiord records. If we assume they they represent major debris flow masses then we find that most of the larger ones lie offshore from major fans, but they are particularly well developed opposite large valley glaciers which either calve into the fiords or terminate a short distance from the fiord margin.

If large debris flows represent a distal sedimentary product of side-entry glaciers, a proximal component of ice-front fans and push moraines was mapped near to the front of a calving glacier on the eastern side of Cambridge Fiord (74°35'E 71°33'N). A sidescan mosaic showing the distribution of push moraines (figs. 8a) and ice-front fans (fig. 8b) was compiled (fig. 9) reflecting net retreat of the glacier since the Little Ice Age glacial maximum, on which minor (probably winter) readvances had been superimposed.

ii. Secondary fiord-side inputs

The submarine fiord sides are generally steep, and angles in excess of 15° or 20° are common. Thus primary accumulations of sediment on these flanks are inherently unstable and the products of slope failure are shown clearly on sidescan records (Syvitski, Blakeney and Hay, 1983). We identify four principal acoustic form/texture cominations which we interpret as products of gravitational movements down fiord-side slopes.

a) (figs. 10-14) Parallel ridges transverse to the slope and occasionally lobate in form which we ascribe to sediment creep (see also Syvitski, Blakeney and Hay, 1983).

b) (figs. 10, 12, 15) Irregular granular-textured slopes commonly with ridges and furrows parallel to the slope. This has the appearance of talus, and we believe that it could represent unremoulded blocks in a remoulded matrix produced by rapid failures. They commonly occur directly in front of texture a), as if they form an apron of blocks in front of major flows, but also appear to emanate from failure scarps.

c) Smooth-surfaced single broad ridges which commonly occur in front of forms a) and b) (figs. 10, 11). We explain these as "load bulges" pressed up in autochtonous sediments beyond the margins of flow masses.

d) Concentric arcs transverse to slope with very high acoustic contrasts (fig. 16). We interpret these as crevasses developed at the top of arcuate failure planes underlying major fjord side failures. The white "shadows" represent the crevasses produced by tensile fracture.

In some instances all these features occur on major rotationally-slumped fiord side masses.

Unfortunately the sidescan fish, generally towed 200m above the fiord floor, does little more than define the toe of failed masses, although echo-sounder profiles often give relatively clear ideas of the form of the masses whose lower parts are defined by sidescan traverses (e.g. figs. 13, 15).

Postulated failure planes at the back of some of these masses are shown on the maps, and indicate their large scale.

Flows from both fiord sides may give the false impression that longitudinal channels occur on the fiord floor, and the frequently raised fronts may simulate levees.

FIGURE CAPTIONS

Figure 1	Geomorphology/Quaternary geology map of Cambridge Fiord and its bathymetry.
Figure 2	Geomorphology/Quaternary geology map of Itirbilung Fiord showing bathymetry, seabed features interpreted from sidescan records, and interpretation of Huntec profile.
Figure 3	Geomorphology/Quaternary geology map of McBeth Fiord showing bathymetry, seabed features interpreted from sidescan records and interpretation of Huntec profile.
Figures 4-7	Slope maps of the submarine parts of fiords contoured in degrees. 4) - Head of Cambridge Fiord 5) - Mid-Cambridge Fiord 6) - Outer Cambridge Fiord 7) - Mid-McBeth Fiord
Figure 8a-b	a) - Sidescan image of ice-front push moraine at the margin of Cambridge Fiord calving glacier b) - Sidescan image of ice contact submarine fan at the margin of Cambridge Fiord calving glacier
Figure 9	Map of push moraines in front of calving glacier in Cambridge Fiord, drawn from sidescan mosaic.
Figure 10	McBeth Fiord (fix 26). Creep folds in fiord side sediments with unremoulded blocks in an outer apron, and a "load bulge" in front.
Figure 11	McBeth Fiord. Sidescan image of lobate flow masses with load-bulges at toe. A bathymetric profile across these features shows them to have relatively low relief. The fix numbers are from the bathymetric survey. This site occurs on the north side of the fiord at fix 69.8in figure 3.
Figure 12	McBeth Fiord (fix74.5). Talus of unremoulded blocks with load bulge at toe.
Figure 13	McBeth Fiord (fix 67.6).The sidescan image shows the toe of a major slump. We believe that the trench at 280m above the fiord floor may represent a tensile fracture at outcrop of the major failure plane underlying this slump.
Figure 14	McBeth Fiord (fix 67.1).Profile across a major flow. We suggest that the bulge at 150m to the right of the sidescan profile line represents a flow front, show by the density change on the sidescan record.
Figure 15	McBeth Fiord (fix 73.2).Profile across a major slumped mass. The darker texture between 5 and 6 on the sidescan image represents the lower coherent front of the slumped mass. The slope segment between 8 and 13 may represent partly unremoulded sediment flows.
Figure 16	McBeth Fiord (fix 66-67). Bathymetric profile across the tensile fracture plane at the back of a rotational slump, clearly shown on the sidescan image.

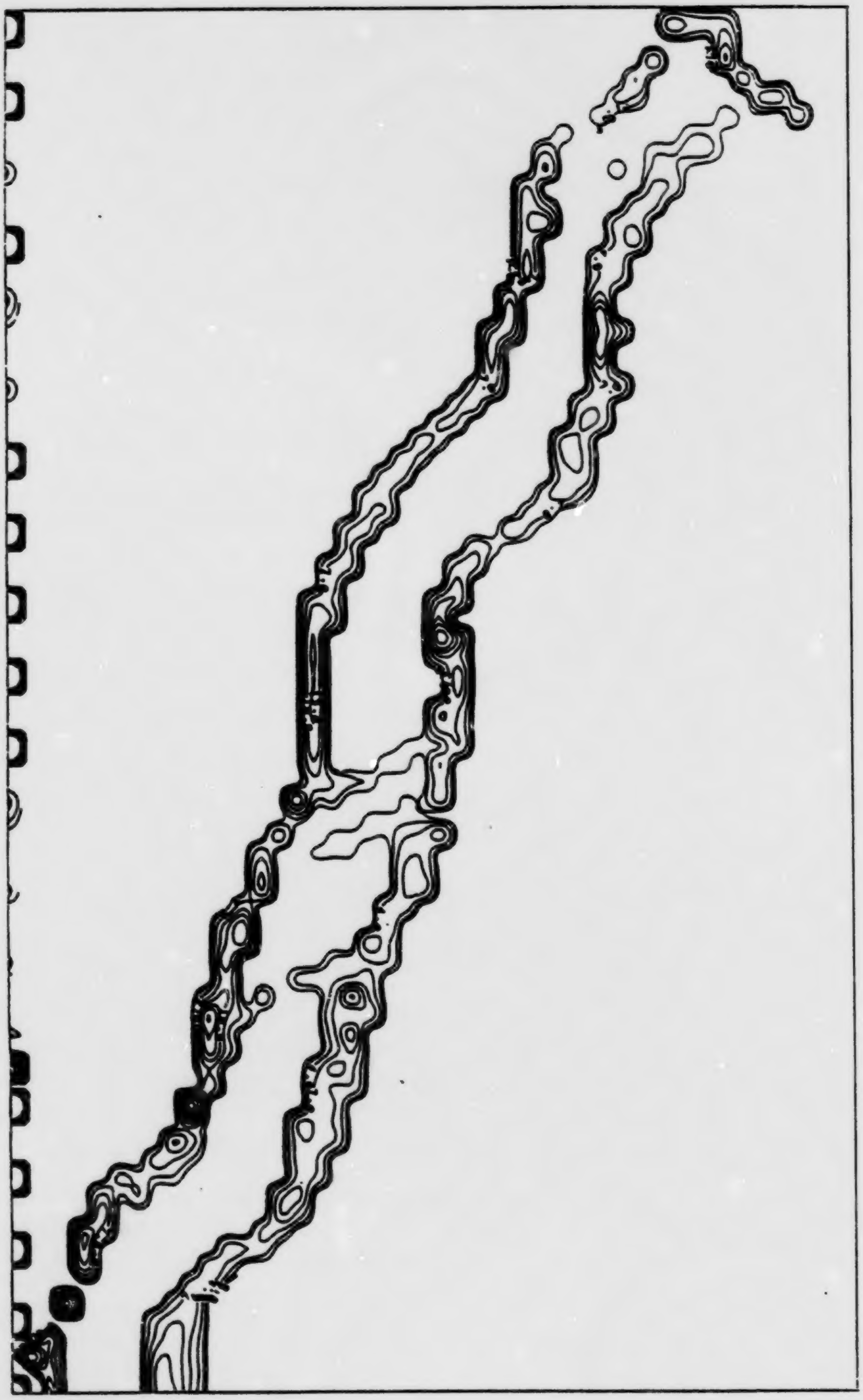

Fig 4 Cambridge Fiord Head

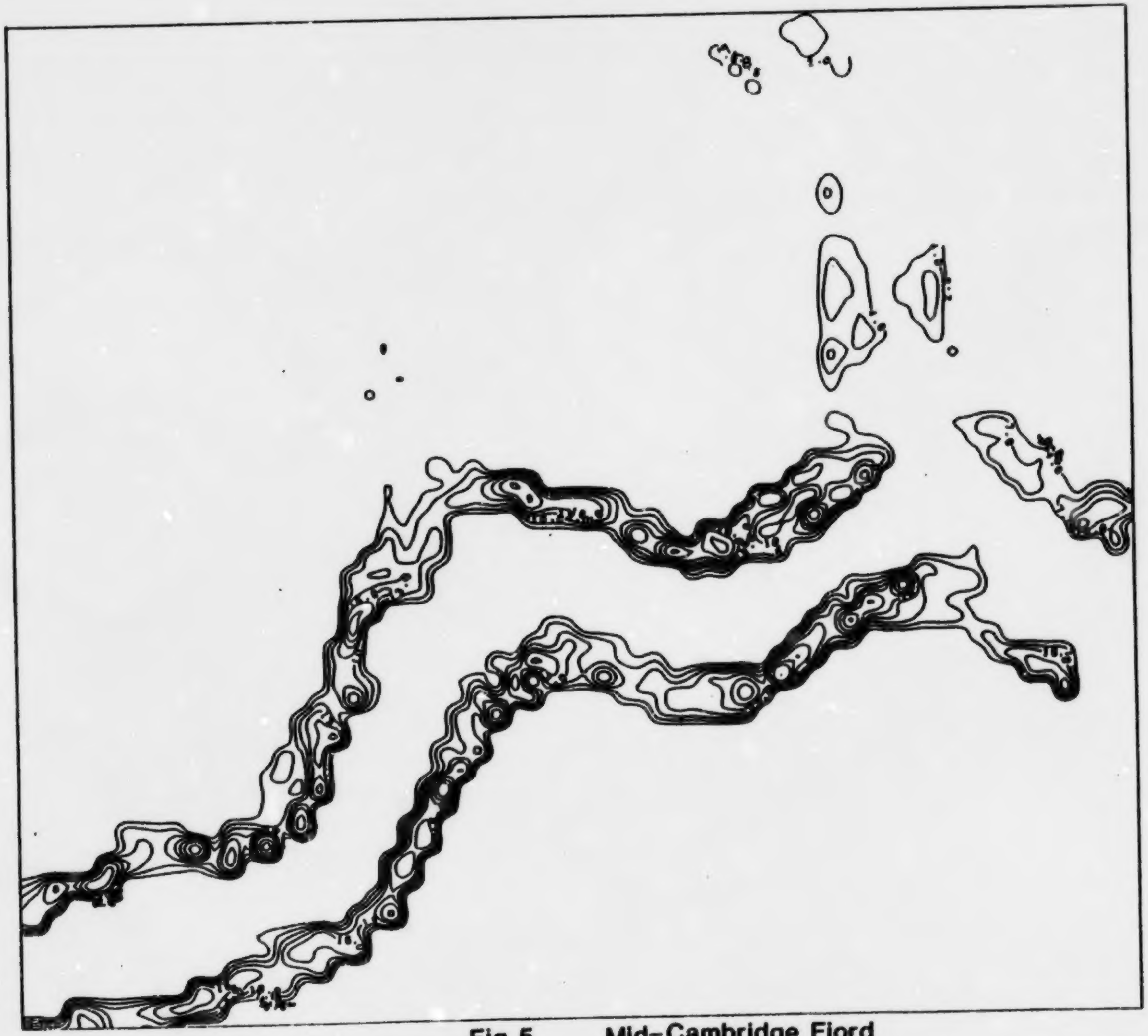

Fig 5 Mid-Cambridge Fiord

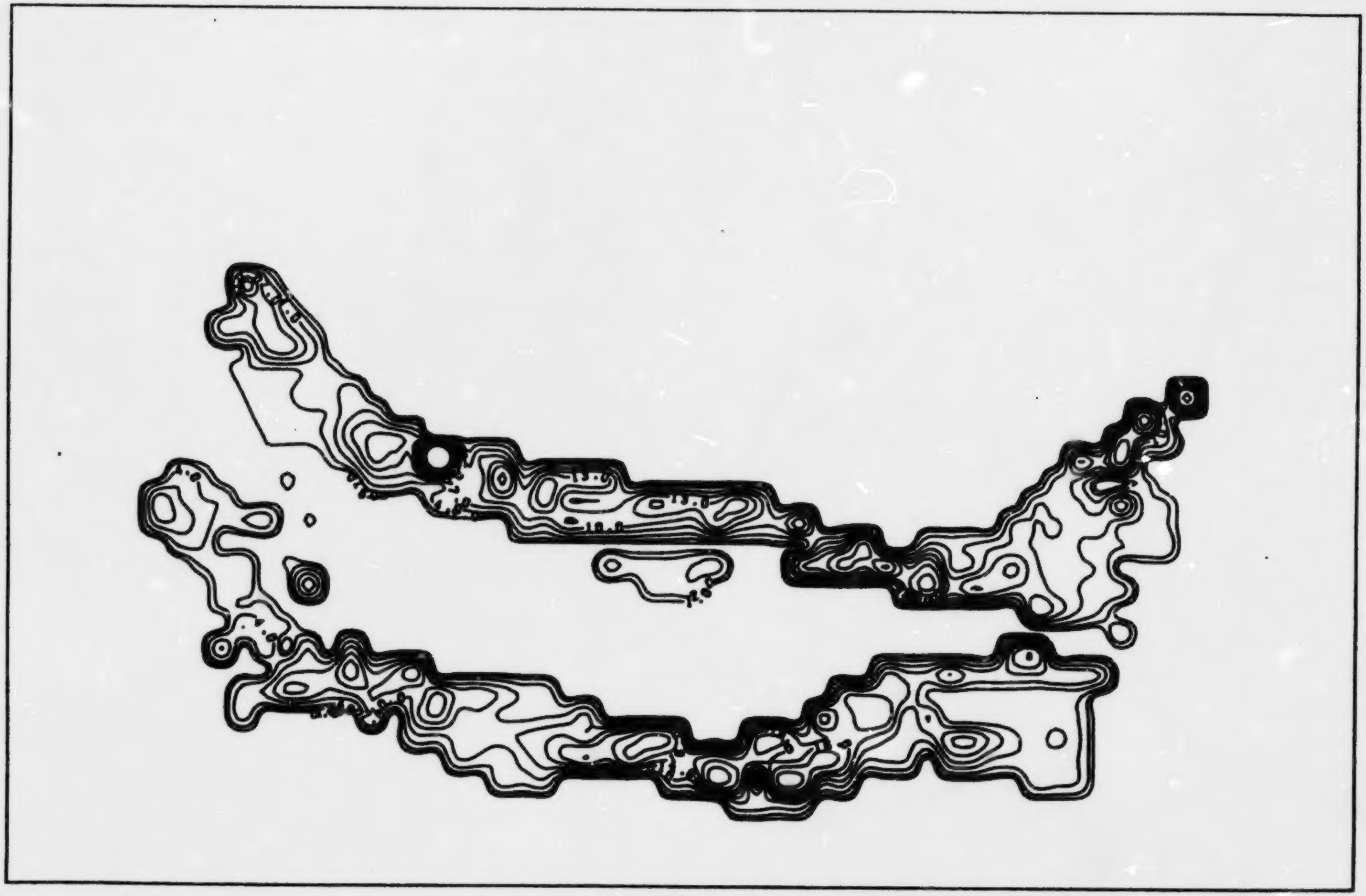

Fig 6 Outer Cambridge Fiord

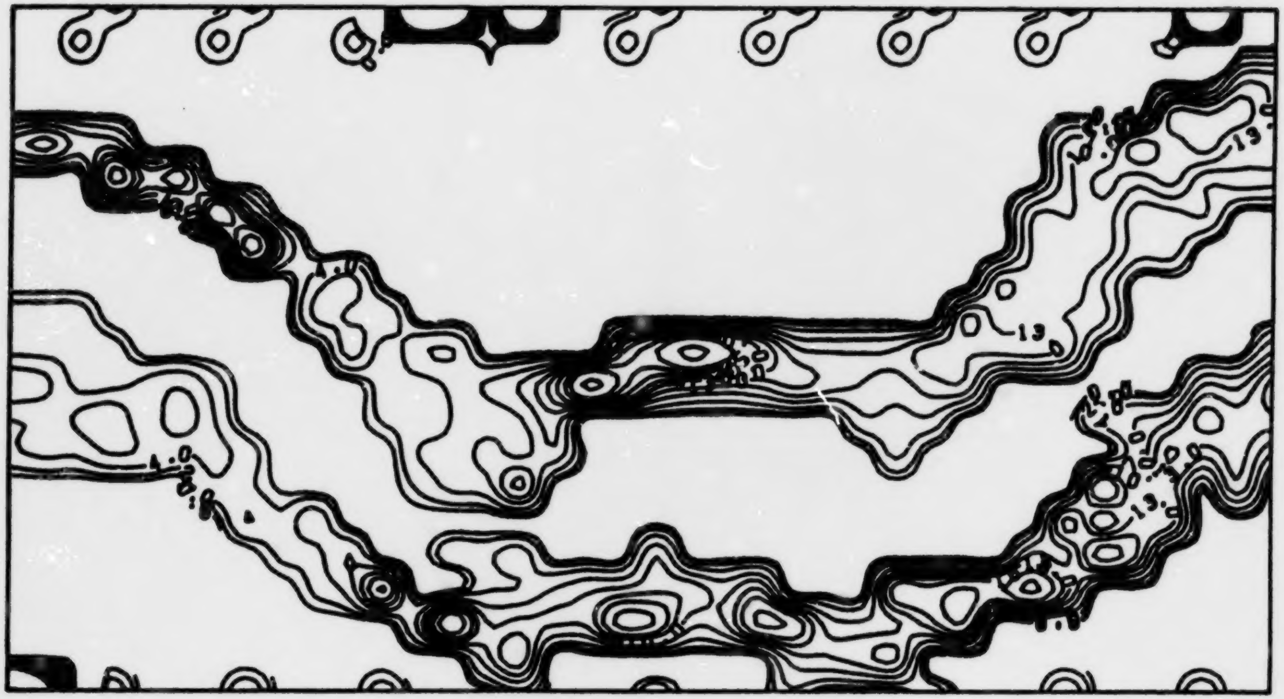

Fig 7 Mid– McBeth Fiord

12-10

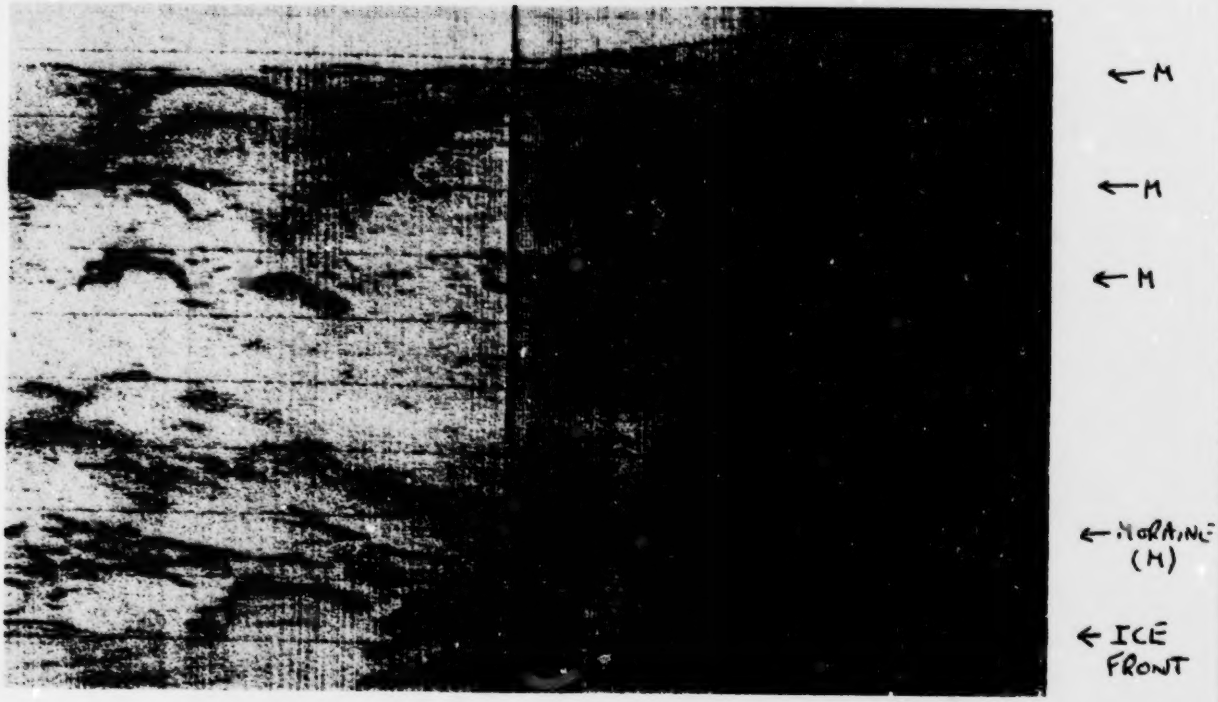

Fig 8a

Fig 8b

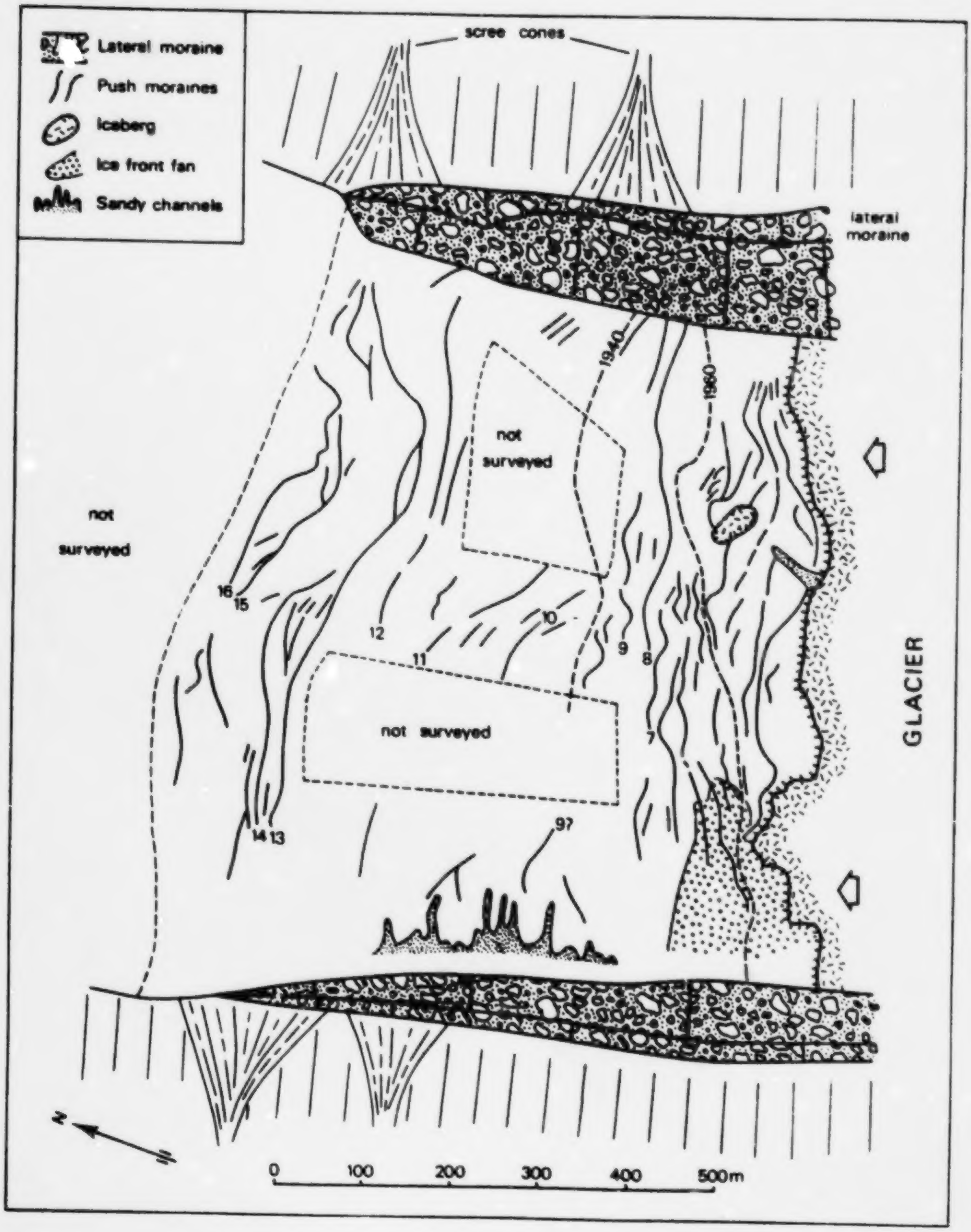
Lateral moraine
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Fig 9

Fig 10

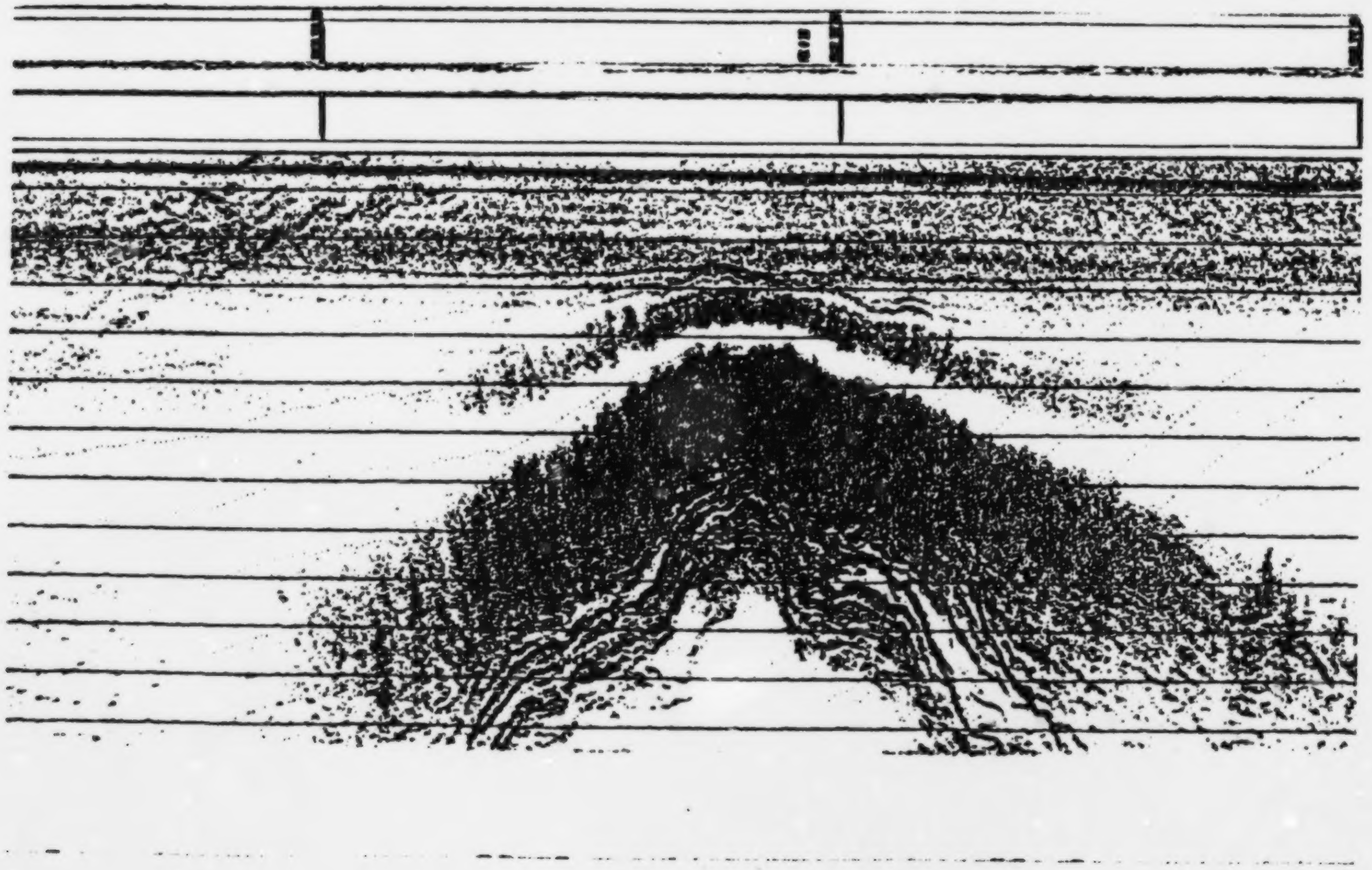

Fig 11

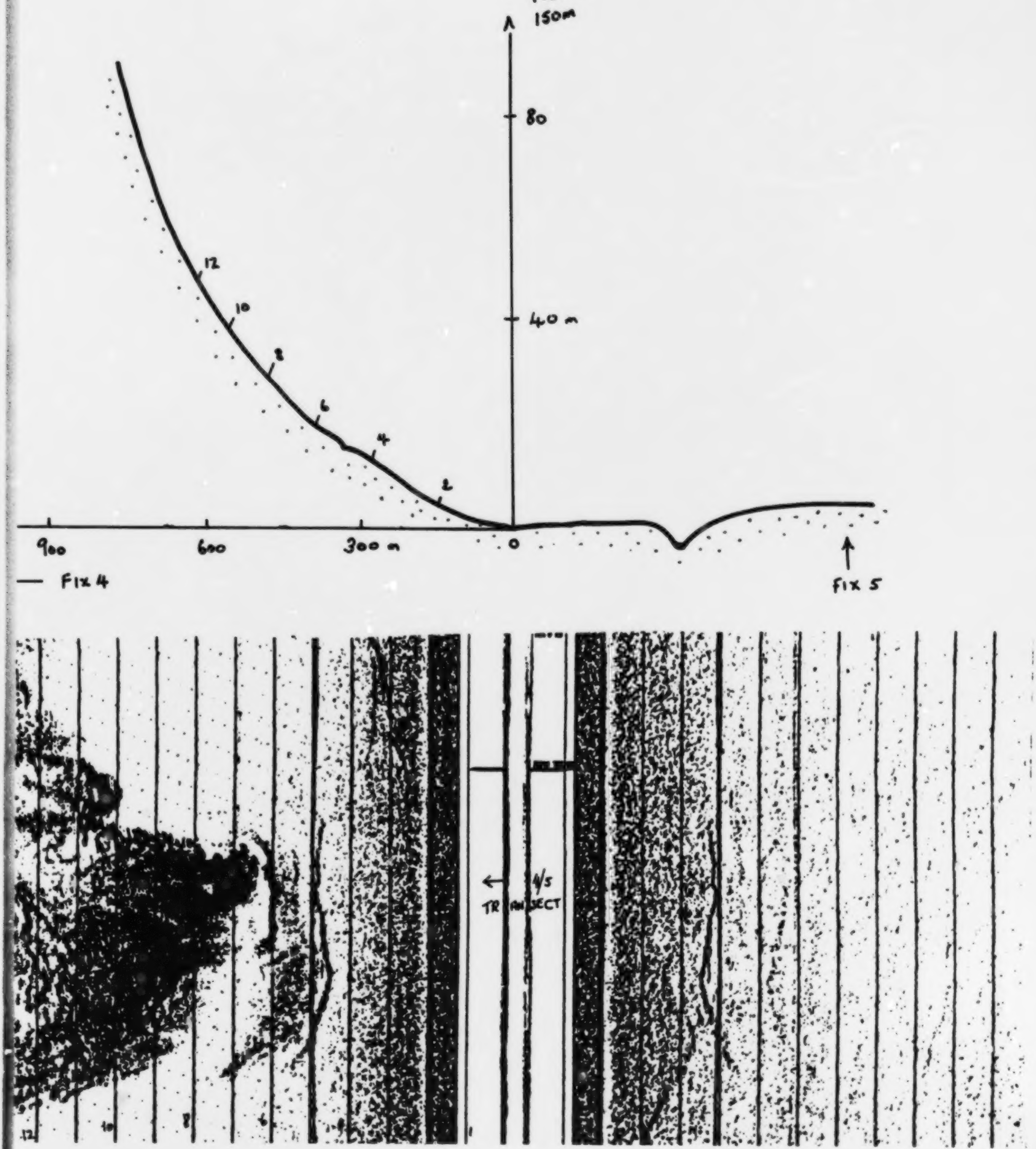
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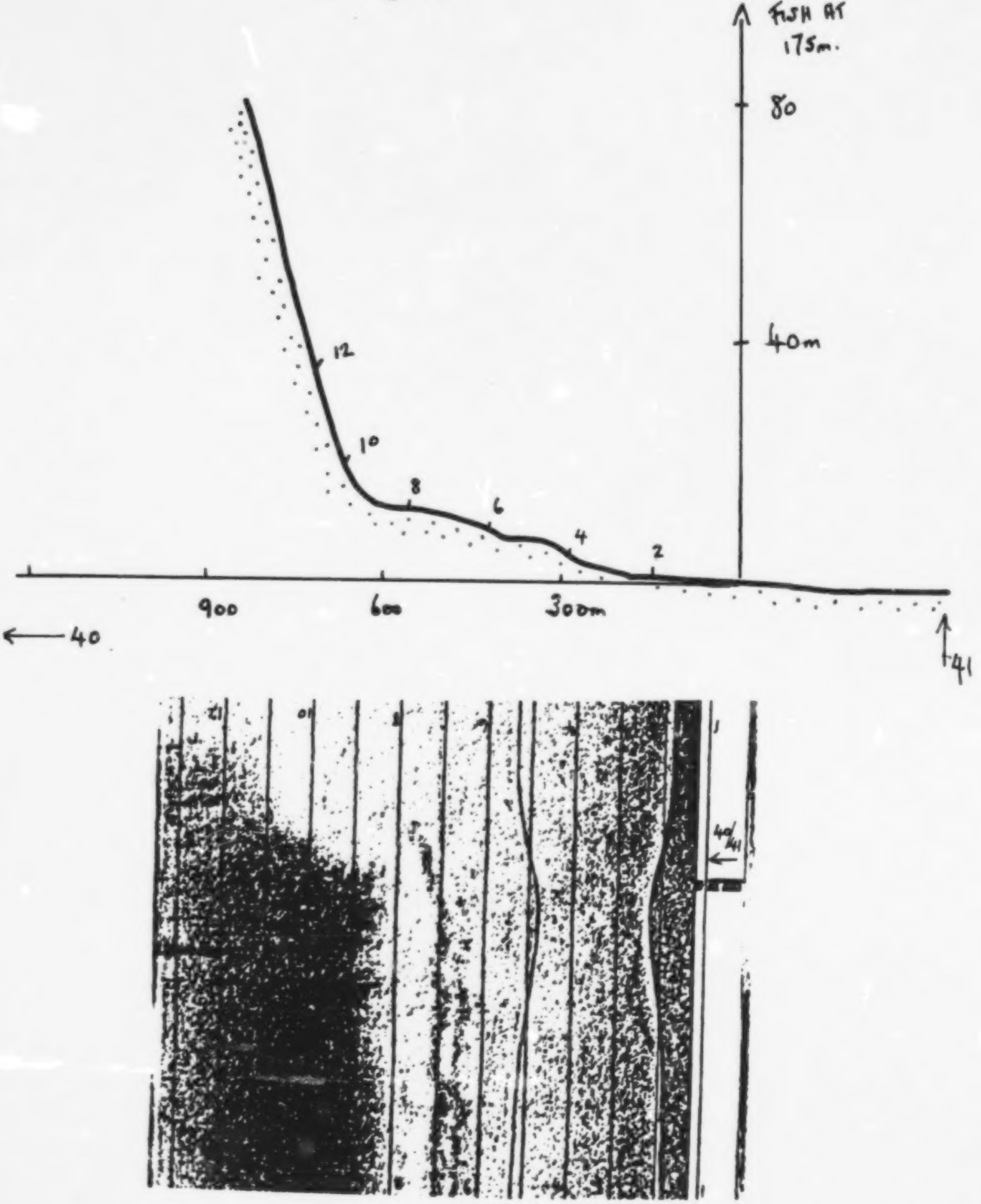
Fig 12



12-15

Fig 13

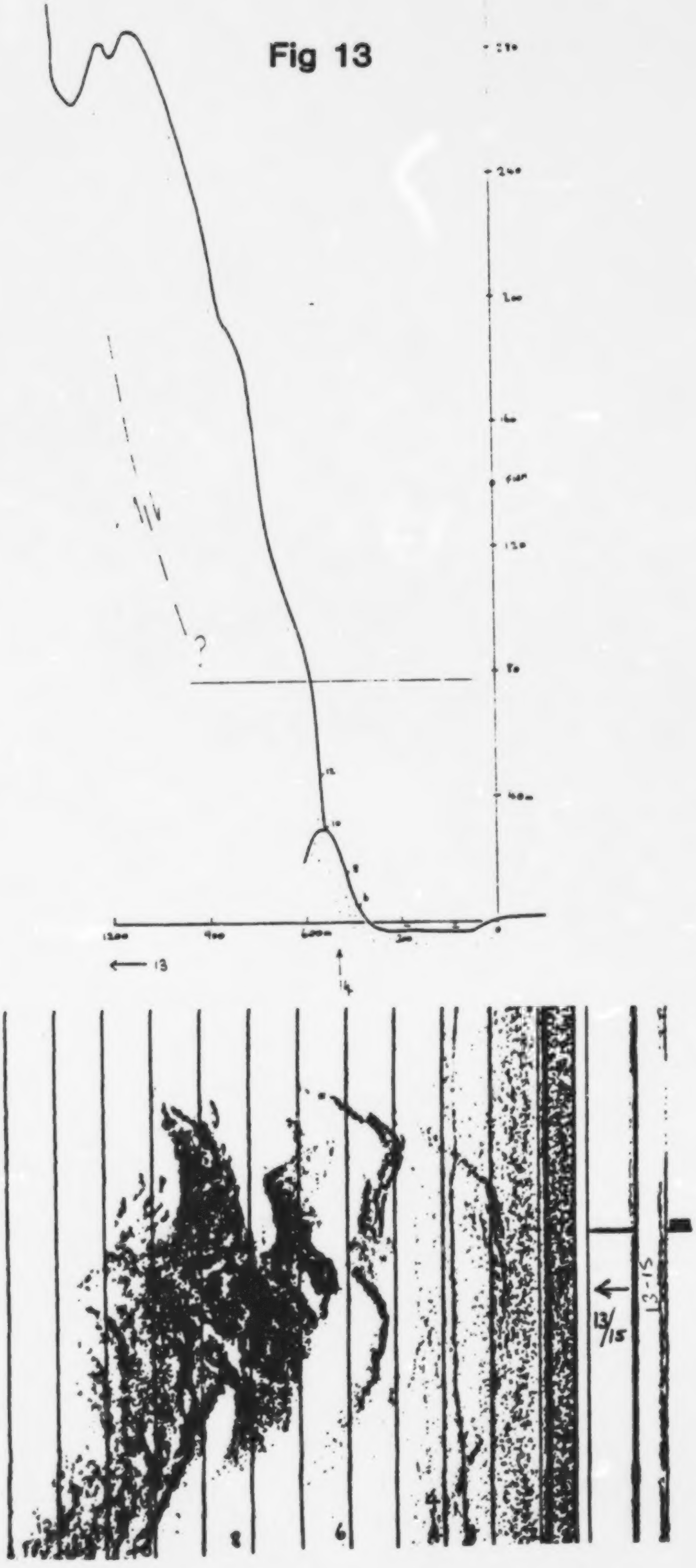

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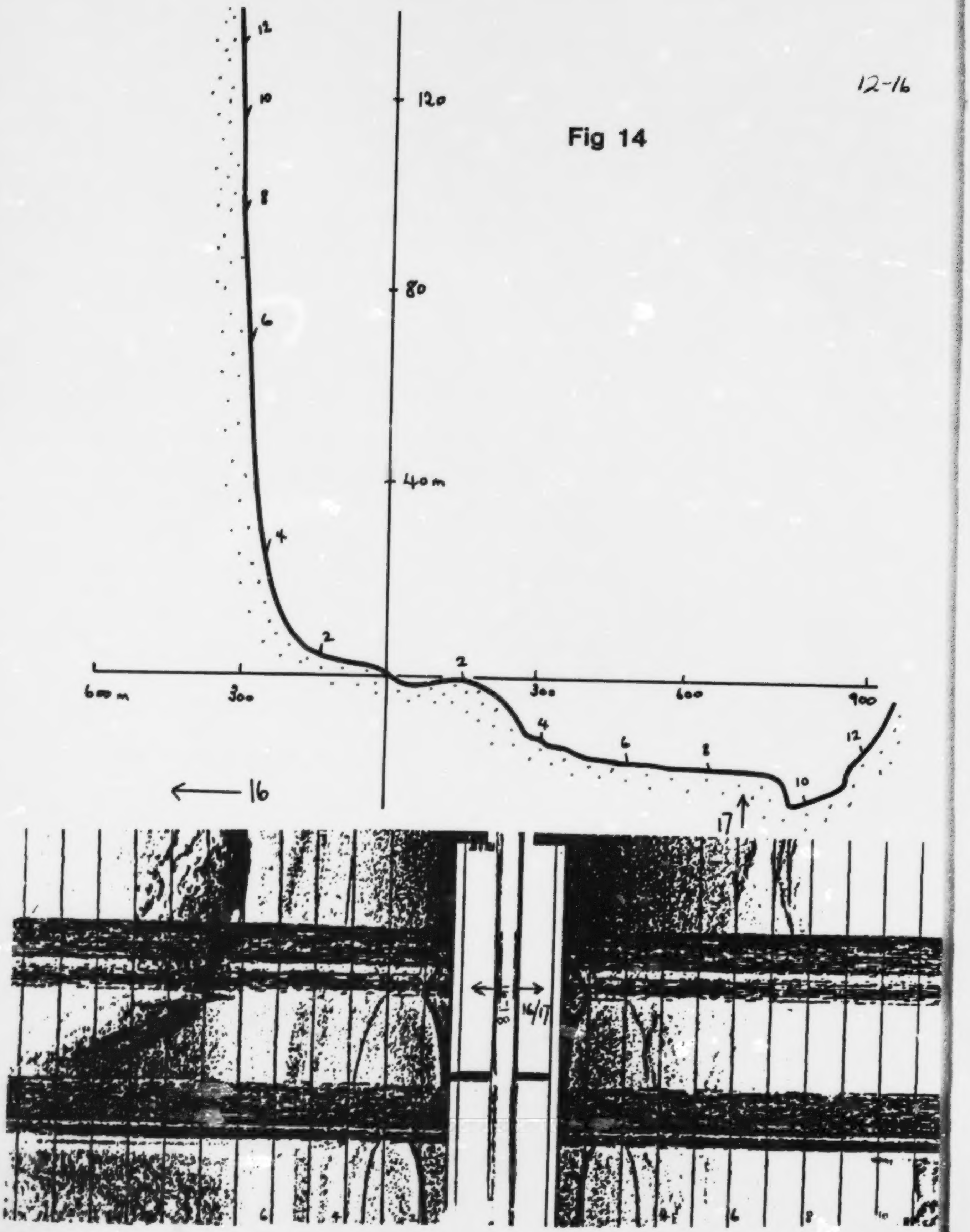
Fig 14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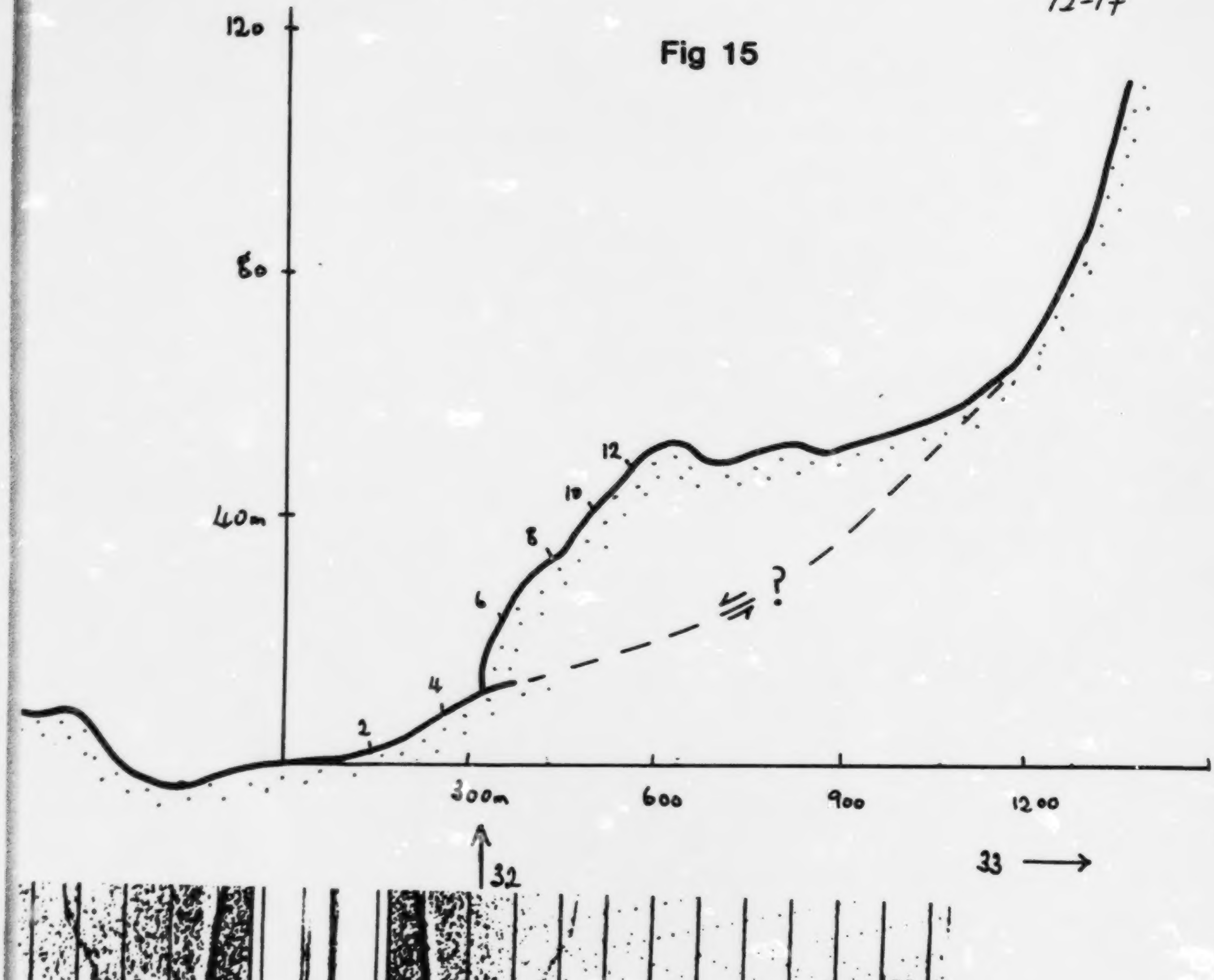
12-17

Fig 15



OBSERVATIONS ON SOME OF THE 1983 PISTON AND LEHIGH CORES FROM ITIRBILUNG, MCBETH AND CAMBRIDGE FJORDS

By

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OBJECTIVES:

To provide a detailed visual and X-radiographic summary of the cores before sampling is carried out; to identify intervals for analysis that will aid in the interpretation and correlation of the Holocene and late glacial sedimentological and paleontological record; to relate the position and depth of penetration of each piston core to the stratigraphic setting depicted by associated reflection seismic records.

FIELD AND LABORATORY METHODS:

Core splitting and logging methods are essentially the same for both Benthos piston and Lehigh gravity cores.

Each three metre piston core barrel was cut into two sections for easier handling and subsequent storage. The sections were split into two half cores, using a router to cut the plastic core liner and a thin wire to cut the sediment.

Both core halves were covered with cling-type plastic wrap, primarily to exclude airborne contaminants such as pollen or smoke, but also to slow the oxidation of exposed sediment surfaces. Oxidation may alter sediment surface colour appreciably within minutes of exposure especially if the organic content of the sediment is high.

One half of each core section was wrapped in heavy plastic and held in reserve as an "archive" half. The other half was labelled as the "working" or "sample" half, and was logged in detail. A tape measure was used to measure the core length in cm and to log the location of sedimentary structures and colours. A Munsell Soil Colour Chart was used for colour determination to insure uniformity of description. All visible structures such as sand beds, laminae, clasts, shells, burrows and mottling have been recorded. The logged core half was then X-radiographed and wrapped in heavy plastic.

Colour and visual descriptions were correlated with the X-radiographs to provide detailed information on sedimentary structures before subsampling.

The 1983 Piston cores were superimposed on high resolution DTS seismic records for both prodelta cores described in this chapter and cores described in chapters 14 and 15 (fig. 13.1 to 13.22). In some cases the Huntec seismic record was taken while the ship was stationary and prior to the coring. In other cases the core locations were superimposed on profile records collected near the core site. In certain cases the 1983 cores were superimposed on both 1982 and 1983 Huntec records; seismic variations therefore result. The travel time shown on the figures is two-way travel time and the approximate depth is based on the velocity of sound through sea water. In the central portion of each figure is a time line (GMT), followed by the day of the year, followed by the year. High frequency resolution DTS records have a tracking line parallel to the seafloor and may be differentiated from low frequency resolution DTS records which have no tracking line. Wherever possible the apparent penetration (largest value in metres) is given with the actual core length recovered (smallest value in metres). The difference may result from compaction of the core during the coring process.

Descriptions of the prodelta cores are based on visual and X-radiographic observations. Examples of core splits are given in Figures (13.23 to 13.26) and examples of typical X-radiography are given in Figures (13.27 to 13.35).

Future data reports will provide detailed litho and paleo description.

FIGURE CAPTIONS:

Huntec DTS seismic records for core sites.

Figure 13.1	Core CA 1.2
Figure 13.2	Core CA 1.6
Figure 13.3	Core CA 2.0
Figure 13.4	Core CA 2.2
Figure 13.5	Core CA 3.0, CA 4.2
Figure 13.6	Core CA 4.1
Figure 13.7	Core CA 4.1, CA 6.0
Figure 13.8	Core MC 0.1, MC 1.0
Figure 13.9	Core MC 2.0
Figure 13.10	Core MC 2.1
Figure 13.11	Core MC 2.2
Figure 13.12	Core MC 4.1
Figure 13.13	Core MC 7.0, MC 83.6
Figure 13.14	Core IT 0.4
Figure 13.15	Core IT 1.0
Figure 13.16	Core IT 1.1
Figure 13.17	Core IT 1.2
Figure 13.18	Core IT 2.1
Figure 13.19	Core IT 2.2
Figure 13.20	Core IT 2.3
Figure 13.21	Core IT 3.0
Figure 13.22	Core IT 3.1

Core Photographs

Figure 13.23 Core IT 0.1. Note the varve-like nature of the core where a mud layer alternates with a muddy sand layer. Also note the intercalations between massive sand with mud interclasts and bioturbated muddy units.

Figure 13.24	Core IT 0.4. (Partial Piston and Lehigh sections) Note the alternation between varve-like beds and sand layers. Also note the variation between Piston and Lehigh lithostratigraphy.
Figure 13.25	Core IT 1.2. (Partial sections only) Note where the sand beds are massive or contain large rounded intraclasts. Core CA 0.1. (Partial section) Showing steeply dipping forset beds. Core CA 1.2. (Partial section) Showing the high energy erosive nature of many of the layer boundaries.
Figure 13.26	Core MC 2.2. (Partial sections only) Note the development of layering downcore based on reduced organic layers.

X-radiographs

Figure 13.27	Core IT 0.1 (Piston) Compare with Fig. 13.23.
Figure 13.28	Core IT 0.3 (Piston) Note the orientation of pebbles as a clue to the mass flow mechanism,a) and c) remoulded slump and b) fluidization.
Figure 13.29	Core IT 0.4. A. Note pebble orientation parallel to bedding. B. Note upper pebbly mudstone unit overlying higher energy rippled sequence. C. Massive (grain flow?) sand units seperated by high angle muddy sands.
Figure 13.30	A. Core IT 0.1. Note occassional truncation of beds in upper section. Compare with Fig. 13.23. B. Core IT 1.2. Note thick graded unit.
Figure 13.31	Core IT 1.2. A. Note graded sandy turbidite layers. B. Note remolded debris flow. C. Note massive sand units separated by rippled beds.
Figure 13.32	Core CA 1.2. Excellent examples of variations in current rippled sequences between flat beds.
Figure 13.33	A. Core MC 2.0. Variations in degrees of bioturbation compare with C. Core MC 2.0 with layered silt units. B. Core MC 2.1. Fluid escape structures overlying massive rippled sand unit.
Figure 13.34	Core MC 2.2. Effects of bioturbation on sediment gravity flow deposits.

ITO.1 Lehigh Core - 15 cm

sfc	7.5YR4/4 oxidized layer.
0-15 cm	5Y3/2 sand, with 5Y4/2 day clasts at bottom.

ITO.1 Piston Core - 266 cm

0-63 cm	Series of laminae of variable thicknesses, each grading downwards from clay into sand or silty sand; clays 5Y4/2, sands 5Y3/2.
63-64 cm	7.5YR2/0 layer of silty clay.
64-95.5 cm	more laminae of 5Y4/2 day grading into 5Y3/2 sands and silts.
95.5-96.5 cm	5Y5/2 oxidized sand with 7.5YR4/4 edging top and bottom.
96.5-98.5 cm	5Y4/2 silty clay.
98.5-100 cm	5Y5/2 oxidized sand, 7-5YR4/4 edging.
100-104 cm	more clay to sandy silt laminae.
104-104.5 cm	7.5YR2/0 silty clay.
104.5-133.5 cm	clay to sand or sandy silt laminae, clays 5Y4/2, sands 5Y3/2.
133.5-137 cm	gravelly sand.
137-213 cm	variable laminae, clay 5Y4/2 into sand or sandy silt 5Y3/2.
213-213.5 cm	7.5YR2/0 silty day.
213-266 cm	More laminae, 5Y4/2 clay into 5Y3/2 sand or silt, with two thin black (7.5YR2/0) laminae at 243.5 cm and 246.5 cm.

ITO.2 Lehigh Cove - 45 cm

0-7 cm	5Y3/2 and intense black, disturbed silty sand.

7-9 cm	5Y3/2 silty, sandy clay.
9-13 cm	5Y3/1 sand.
13-14.5 cm	5Y4/2 silt.
14.5-16.0 cm	5Y3/1 sand.
16-29 cm	variable laminae of 5Y4/2 silty clays grading downwards into 5Y3/1 sands.
29-30 cm	silty sand, 5Y3/1, with two thin bands of 2-5Y2.5/1.
30-34 cm	more 5Y4/2 silty day and 5Y3/1 sands.
34-45 cm	disturbed laminae; this section shows flow of sediments downward into core catcher space, probably due to high water content of sediments.

IT0.3 Lehigh Core - 150 cm

sfc	5Y4/4 oxidized.
0-4 cm	5Y4/2 and 5Y4/4 silty clays.
4-8.5 cm	5Y4/2 silty, sandy clay.
8.5-9.0 cm	5Y3/2 sand.
9-16 cm	variable laminae of 5Y4/2 clays grading downward into 5Y3/2 sands.
16-18 cm	5Y3.5/2 mottled sandy, silty clay.
18-30.5 cm	laminae of 5Y4/2 clays and 5Y3/2 sands.
30.5-33 cm	mottled 5Y3.5/2 and 5Y4/2 silty clay.
33-34 cm	5Y3.5/2 and 5Y3/2 mottled silty, sandy clay.
34-43 cm	laminae of 5Y4/2 clays, 5Y3.5/2 silts and 5Y3/2 sands.
43-45 cm	5Y4/2 and 5Y4/4 bioturbated silty clay.
45-49 cm	5Y4/2 and 7.5YR2/0 bioburbated silty clay.
49-50 cm	5Y3/2 bioturbated sands.

50-54.5 cm	less mottled clay grading down into sands, as above.
54.5-72 cm	laminae, 5Y4/2, and 5Y3/2.
72-84 cm	mottled silty clay, 5Y4/2 and 7.5YR2/0.
84 cm	thin sand laminae, 5Y3/2.
84-92 cm	mottled silty sand, 5Y3/2, 5Y4/2, 7.5YR2/0.
92 cm	thin sand laminae, 5Y3/2.
92-97 cm	somewhat mottled, bioturbated silty, sandy clays, 5Y4/2 and 7.5YR2/0.
97-106 cm	heavier mottling, grading to sands at 106 cm.
106-129 cm	repetitive laminae of 5Y4/2 and 7.5YR2/0 bioturbated clays grading into sands at bottom, sands 5Y3/2 and usually not bioturbated.
129-130 cm	clay layer 5Y4/2, not bioturbated.
130-147 cm	more mottled laminae; mottling decreasing downward very gradually.
147-150 cm	5Y3/1 sand.

ITO.3 Piston Core - 427.5 cm

0-10 cm	5Y3/1 with a large section of 5Y5/2, all sand.
10-33.5 cm	5Y4/1 sand.
33.5-50 cm	5Y4/1 clay, with large pebble at 33.5-36 cm, surrounded by aureole of 7.5YR2/0.
50-59.5 cm	5Y4/1 day, somewhat mottled.
59.5-125 cm	5Y3/1 silty sand with scattered 5Y4/1 clay clasts; mottled slightly with 7.5YR2/0.
125-163 cm	mottled 5Y4/1 clay, vertically structured, probably sucked sediment.

163-427.5 cm	clay in large clasts, surrounded by sand. Sucked sediment.

ITO.4 Lehigh Core - 135 cm

0-4 cm	5Y4/2 and 5Y4/4 mottled silty clay.
4-7 cm	5Y4/2 silty clay grading downwards into 5Y3/2 silty sand.
7-10 cm	similar layer with burrowing visible in silty clays.
10-17 cm	bioturbated silty clay and sand.
17-22 cm	5Y4/2 clay showing faint, thin laminae.
22-22.5 cm	5Y3/2 sand with clay filled burrows.
22.5-24 cm	unbioturbated layer of 5Y4/2 silty clay grading into 5Y3/2 sand.
24-33 cm	more laminae of bioturbated clays and sands.
33-35 cm	sand, 5Y2.5/1, with clay filled burrows.
35-36.5 cm	5Y4/2 clay grading into 5Y3/2 sand.
36.5-38.5 cm	5Y4/2 and 5Y4/4 mottled silty clay.
38.5-42 cm	5Y4/2 and 7.5YR2/0 mottled silt, grading into 5Y3/1 sand.
42-50 cm	5Y4/2 and 5Y3/2 silty clay with faint, broken sand laminae visible.
50-65 cm	more laminae of clay and sand, mottled and bioturbated.
65-67.5 cm	5Y4/2 almost unmottled silty clay.
67.5-70 cm	mottled silty day, 5Y4/2 and 7.5YR2/0.
70-70.5 cm	unmottled 5Y4/2 clay.
70.5-74 cm	laminae, mottled, with 5Y3/1 sand layer.
74-76 cm	no mottling; 5Y4/2 silty clay.

76-78 cm	5Y4/2 silty clay with 7.5YR2/0 mottlings.
78-99.5 cm	alternating mottled and unmottled silty clay layers.
99.5-100 cm	sand, 5Y3/1.
100-105 cm	alternating mottled 5Y4/2 and 7.5YR2/0 silty clays and 5Y3/2 sands.
105-106.5 cm	unmottled 5Y4/2 silty clay.
106.5 cm - 135 cm	more alternating, bioturbated laminae.

IT0.4 Piston Core - 325 cm

sfc	7.5YR4/4 oxidized sand.
0-9 cm	5Y4/1 silty clay.
9-20.5 cm	5Y3/1 sand, with very large 5Y4/1 clay clast.
30.5-40.5 cm	laminae of 5Y4/1 clays, grading into 5Y3/2 silty sand, with a black sand layer at 34 cm and more black, 7.5YR2/0, at 40.5 cm.
40.5-65.5 cm	mottled silty clay, 5Y4/1 with 7.5YR2/0, with irregular contact 61-65.5 cm, broken clay, sand clasts, 542.5/1 sands and 5Y4/2 clays.
65.5-98 cm	laminae of variable thicknesses, 5Y4/1 clays grading into 5Y3/2 sands; some black 84-86 cm, sands becoming 5Y3/1 as you go downwards.
109.5-110.5 cm	7.5YR2/0 silty sand.
110.5-113 cm	5Y2.5/1 and 7.5YR2/0 sand.
113-119 cm	irregular 5Y4/1 clay to 5Y3/1 silty sand laminae.
119-120 cm	7.5YR2/0 silty sand.

120-186.5 cm	silty sands, variably mottled, ranging from 5Y3/1 at top, through 5Y3/2 and 7.5YR2/0, to a 5Y4/2 layer at 136 cm, then mixed 5Y3/1, 5Y3/2 and 7.5YR2/0.
186.5-194 cm	several laminae, 5Y4/1, 5Y3/1, 7.5YR2/0, 5Y2.5/1 and other closely related colors.
194-195 cm	7.5YR2/0 and 5Y2.5/1 sand.
195-197 cm	silt and clay laminae, 5Y3.5/1 and 5Y2.5/1.
197-198 cm	7.5YR2/0 sand.
198-200.5 cm	5Y3/2 sand.
200.5-208 cm	5Y4/1, 5Y3.5/1 silty clays and 5Y2.5/1, 5Y3/1 sands in laminae.
208-209 cm	gently waved silt layer, 5Y4/2.
209-214 cm	sand, 5Y3/1, with a clay and silt clast showing two layers of colors, 5Y4/1 and 5Y3/1.
214-236 cm	5Y5/2 sand.
236-240 cm	5Y4/2 sand.
240-255 cm	5Y3/2 and 7.5YR2/0 mottled sand, with 5Y4/1 clay clays at 247-249 cm.
255-274 cm	5Y4/2 sand.
274-275.5 cm	5Y3/1 silty sand; at bottom is very thin layer 5Y4/1 clay.
275.5-280.5	5Y3/1 silty sand, with thin layer 7.5YR2/0.
280.5-325 cm	5Y4/2 sand with 5Y3/2 and 7.5YR2/0 mottlings.

IT 1.1 Lehigh Core - 48 cm

sfc	5Y4/4 oxidized.
0-7 cm	5Y4/2 silty clay.

7-15 cm	5Y4/2 silty clay with large 5Y4/4 burrows.
15-20 cm	sandy, 5Y4/2 and 7.5YR2/0.
20-24 cm	5Y4/2 silty clay, slightly mottled.
24-48 cm	5Y4/2 silty day with 7.5YR2/0 burrows.

IT 1.2 Piston Core - 624 cm

sfc	oxidized, 5Y4/2.
0-25 cm	sand, 5Y5/1, grading into 5Y4/2, with clay clast 20-25 cm, 5Y4/1 in color.
25-33 cm	5Y3/1 silty sand mottled with 5Y5/2, 5Y2.5/1 and some 7.5YR2/0.
33-34.5 cm	5Y5/2 sand.
34.5-38.5 cm	34.5-38.5 cm 5Y3/1 mottled silty clay, some sand.
38.5-48.5 cm	series of thin sand and clay laminae, mottled, bioturbated; 5Y3/1, 7.5YR2/0.
48.5-50 cm	7.5YR2/0 irregular layer of silty sand.
50-70 cm	5Y3/1 laminae, broken, irregular, mottled with 7.5YR2/0.
70-71.5 cm	7.5YR2/0 silty sand.
71.5-80.5 cm	more irregular laminae.
80.5-83.0 cm	7.5YR2/0 silty sand.
83.0-89.0 cm	5Y3/1 mottled sandy, silty clay, with 7.5YR2/0.
89-91.0 cm	silty sand, 5Y2.5/1 and 7.5YR2/0.
91-91.5 cm	sandy, silty clay 55Y3/1.
91.5-92.5 cm	7.5YR2/0 silty sand.
92.5-106 cm	5Y3/1 sandy, silty clays, mottled with 7.5YR2/0.
106-112 cm	5Y4/2 and 7.5YR2/0, some 5Y3/1 silty, sandy mottled clay.

112-122 cm	alternating layers of 5Y3/1 sand and 5Y4/2 silty, sandy clays.
122-137 cm	5Y2.5/1 and 7.5YR2/0 quartz sand with gravel, some clay and silt.
137-141.5 cm	5Y3/2 to 5Y3/1 and 5Y4/2 graded laminae, sandy silty clay and sand.
141.5-142.0 cm	7.5YR2/0 silty sand.
142-146.5 cm	5Y4/2 silty, sandy clay.
146.5-147 cm	5Y2.5/1 silty sand.
147-157 cm	laminae of silty clay grading into sand, 5Y4/2 clays, 5Y2.51 and 7.5YR2/0 sands.
157-221 cm	variable laminae of grading mixed silty clays and sands, clays 5Y4/2, 5Y3/2, and sands 5Y2.5/1, some 7.5YR2/0, 5Y3/1.
221-233 cm	5Y2.5/1 and 7.5YR2/0 mottled sand, some 5Y3/1.
233-233.5 cm	7.5YR2/0 sandy, silty clay.
233.5-344 cm	5Y3/2, 5Y3/1, 7.5YR2/0 mottled sandy silty clay.
344-353 cm	sand, same colors.
353-355 cm	5Y3/2 silty clay.
355-371 cm	5Y3/1 and 5Y3/1 with 7.5YR2/0 and 5Y2.5/1; mixed, mottled silty sands, silty clays, all heavily bioturbated, with no visible laminae.
371-376 cm	5Y2.5/1, some 7.5YR2/0 mottled sand.
376-422 cm	5Y4/1, 5Y3/1, some 7.5YR2/0 and 5Y3/2 bioturbated, mottled silty clays and sands, no visible laminae.
422-425.5 cm	5Y2.5/1 sandy layer.
425.5-479 cm	5Y3/1, 5Y3/2, 5Y4/1 mottled, massive sandy silty clay.

47-492 cm	5Y2.5/1 sand.
492-494 cm	5Y2.5/1 sand with silty, sandy clay clasts, 5Y4/2.
494-507 cm	5Y2.5/1 sand, some 5Y4/2 clay clasts.
507-542 cm	5Y5/2 sand, with large silty clay clasts 5Y2.5/1, and some 7.5YR2/0 mottling.
542-588.5 cm	sand, color changing gradually from 5Y5/2 at top, to 5Y4/1 in middle, to 5Y3/1 at bottom.
588.5-592 cm	5Y2.5/1 silty sand.
592-613 cm	5Y3/1 sand.
613-624 cm	5Y2.5/1 silty day, mottled with 7.5YR2/0.

CA 0.1 Piston Core - 128 cm

0-17 cm	5Y4/2 laminae, very thin, predominantly silty clay with firm texture.
17 cm	thin sand layer, with pebble.
17-28 cm	more 5Y4/2 laminae.
28 cm	sand layer.
28-40 cm	more 5Y4/2 laminae.
40 cm (39-41 cm)	distinct, sloping contact; below this level, laminae show increasing slope as go downward in core.
40-80 cm/41-83 cm	5Y4/1 laminae, sloping down to one side.
80-83 cm	slope of contact.
80-81 cm/83-84 cm	5Y3.5/2 silty clay layer.
81-98 cm/84-100 cm	more 5Y4/1 laminae, with some 7.5YR2/0 mottling at 85 cm.
98-112 cm	5Y3.5/2 to 5Y3.5/1 laminae of silty, sandy claye with
100-116 cm	strong slope still, sand increasing towards bottom.

112-128 cm	firm, 5Y3.5/1 silty sand.
116-128 cm	

CA 1.1 Piston Core - 710 cm

0-2.5 cm	5Y3/1 soft clay.
2.5-43 cm	5Y4/2 soft clay, bioturbated; mottled with 5Y2.5/1 and 7.5YR2/0.
43-48 cm	5Y4/2 unmottled clay.
48-120 cm	5Y3.5/1 with 7.5YR2/0 mottling; soft clays, bioturbated, worm burrows visible; gastropod at 62 cm.
120-210 cm	colors 5Y4/1, 5Y2.5/1 with 7.5YR2/0 mottling; silty clays, mottling slowly decreasing as you go down in core.
210-260 cm	5Y4/1, 5Y3.5/1, some 7.5YR2/0 bioturbated, mottled silty clays, bioturbation still decreasing.
260-420 cm	5Y4/1, 5Y3.5/1 mottling in silty clays; mottling decreasing.
420-564 cm	5Y4/1 with faint traces of 5Y3/1; mottling marks very faint in silty clays, becoming all 5Y4/1.
564-681 cm	5Y4/1 dominant; no bioturbation, very faint, thin laminae of silty clays and sandy silts visible; sands 5Y3/2; laminae developing slight slope.
681-710 cm	sediments mixed and distorted - sucked up.

CA 1.2 Piston Core - 495 m

(top section of core (0-117) was stored upside down)

0-2 cm	oxidized 5Y3/1.

2-11.5 cm	5Y3.5/1 silty clays.
11.5-12 cm	7.5YR2/0 sand.
12-17.5 cm	5Y3.5/1 silty clay.
17.5-18 cm	5Y2.5/1 sand.
18-20 cm	5Y3.5/1 silty clays.
20-23 cm	5Y4/1 and 5Y3/1 sand layers.
23-56 cm	laminae of 5Y4/1 silty clays grading into 5Y3/1 silty sands, with some 7.5YR2/0.
56-80 cm	more 7.5YR2/0 present; sediments disturbed, laminae distorted, darker, with small sand pockets.
80-176 cm	thin 5Y4/1 laminae, some 5Y2.5/1 and 7.5YR2/0, 5Y3/1.
176-179 cm	irregular sand layer.
179-258 cm	5Y4/1 laminae, some 5Y3/1, 5Y2.5/1, 7.5YR2/0.
238-260 cm	sand layers.
260-279 cm	more 5Y4/1, thin laminae, with other colors as above.
279-280 cm	sand and gravel.
280-296 cm	laminae.
296-297 cm	sand.
297-346 cm	laminae of less regular thicknesses, silty sands and silty clays, 5Y4/1 with 5Y2.5/1, 5Y3/1, 7.5YR2/0.
346-363 cm	distorted, mixed sand, clay clasts, 5Y3/1 sands, some 7.5YR2/0 and 5Y2.5/0, and 5Y4/1 clay.
363-390 cm	distorted laminae of sand and silt, 5Y3/1, 5Y4/1.
390-410 cm	distorted sand, sandy silt laminae.
410-430 cm	silty clay, silty sands.
430-495 cm	more distorted sediments.

MC 2.0 Piston Core - 724 cm

0-11 cm	5Y4/1 finely bioturbated, silty clay.
11-13 cm	5Y3/1 sand.
13-36 cm	5Y4/1 heavioy bioturbated silty clay; burrows 7.5YR2/0 and intense black, showing somewaht horizontally oriented mottling.
36-75 cm	5Y4/1 with intense black mottling in silty clays; no orientation to bioturbation burrows.
75-84 cm	75-81 cm, 2.5Y3.5/0 silty clay with 5Y4/1 clay clasts, sloping contact to 84 cm at one side, slope composed primarily of 5Y3/1 sands.
81/84-89 cm	5Y4/1 sandy, silty clay, finely bioturbated.
89-96 cm	5Y4/1 and intense black, showing vertical striae.
96-102 cm	5Y4/1 and 2.5Y3.5/0 disturbed, mixed sediments.
102-129 cm	5Y4/1, 5Y3/1, 7.5YR2/0, 2.5Y2.5/0 mottled, bioturbated silty clays.
129-130 cm	7.5YR2/0 layer.
130-139 cm	5Y3/2 silty clay.
139-141 cm	5Y2.5/2 sandy silt.
141-145 cm	5Y3/2 silty clay.
145-146 cm	5Y3/1 silty sand.
146-169 cm	5Y3/2 silty clay with distinct, scattered, intense black bioturbation marks.
169-178 cm	5Y3/2 silty clay with more intense bioturbation.
178-183 cm	5Y3/2 silty clay, less bioturbation.
183-187 cm	5Y3/2, more bioturbation.
187-189 cm	pebble.

189-196 cm	5Y3/2 grading into 5Y4/1, bioturbated with intense black, mottling growing less; silty clay still.
196-223 cm	5Y4/1 silty clay with intense black markings.
223-224 cm	7.5YR2/0 layer.
224-234 cm	5Y4/1 silty clay with intense black burrows, somewhat horizontally oriented.
234-234.5 cm	7.5YR2/0 layer.
234.5-310 cm	5Y4/1 silty clay, with markings of intense black and 7.54YR2/0, oriented somewhat horizontally, growing less heavy as go down in core.
310-311 cm	layer showing very heavy 7.5YR3.5/0 and intense black mottlings.
311-350 cm	5Y4/1 silty clays with bioturbation marks in intense black, some layers more heavily marked than others.
350-412 cm	5Y4/1 silty clays, intense black bioturbation marks slowly increasing, still somewhat horizontally oriented.
412-416 cm	predominantly 7.5YR2/0.
416-422 cm	bioturbation more intense.
422-460 cm	5Y4/1 clays and silts, with black, more scattered borrows; marks also larger in size.
460-466 cm	5Y4/1 silty clay, no bioturbation.
466-500 cm	5Y4/1 with black markings of burrows.
500-501 cm	gap.
501-530 cm	5Y4/1 silty clay with scattered, intense black, burrows.
530-531 cm	7.5YR2/0 layer.

531-577 cm	laminae, of 5Y4/1 silty clays, somewhat mottled, grading down into somewhat darker (7.5YR3.5/0) sediments, with distinct, mottled zones between zones of laminae.
577-602 cm	5Y4/1 grading to 5Y3/1, clays and silts, some sands, with zones of intense black mottling 586-591.5 cm, and 592.0-598 cm.
602-603 cm	5Y4/1, intensely bioturbated silty day.
603-607 cm	5Y4/1 silty clay, less bioturbation.
607-613 cm	5Y4/1 silty clay, intense, horizontally oriented, bioturbation.
613-655 cm	5Y4/1 silty clay with intense black and 7.5YR2/0 bioturbation mottles.
655-657.5 cm	5Y4/1 silty clay, no mottling.
657.5-660 cm	5Y3.5/1 silty clay.
660-662 cm	5Y3.5/1 silty clay with black and 7.5YR2/0 mottling.
662-663 cm	5Y4/1 with intense black and 7.5YR3.5/0.
663-724 cm	5Y4/1 with intense black; bioturbated silty clays.

MC 2.1 Piston Core - 263 cm

sfc	5Y3/1 oxidized, fine silt.
0.5-4 cm	5Y4/2 sand, with 5Y3/1 silt clast.
4-7.5 cm	5Y3/1 + 5Y3/2 mottled silty clay.
7.5-11.5 cm	5Y4/2, 5Y5/2 sand in irregular layer, with 5Y3/2 clay clasts.
11.5-19.5 cm	5Y3/2 silty clay laminae, with 7.5YR2/0 flecks.
19.5-20.5 cm	5Y4/2 sand.
20.5-22.5 cm	5Y3/2 silty clay grading to 5Y4/2 sand; several laminae.

22.5-25.0 cm	5Y4/2, 5Y5/2 sand with thin silt layer.
25-57 cm	5Y3/1, 5Y3/2, 7.5YR2/0 series of silty clay to silty sand laminae.
57-60 cm	5Y3/1 silty clay with 7.5YR3/0 and 7.5RY2/0 mottling.
60-62 cm	5Y3.5/2 silty clay.
62-80 cm	5Y3/1 and 5Y3/2 sand, some 7.5YR2/0.
80-84.5 cm	5Y3/2 clays.
84.5-87.5 cm	5Y3/1 sand.
87.5-89.5 cm	5Y3/1 clay, with 5Y4/1 mottling.
89.5-92.5 cm	5Y3/1 sand, with 5Y2.5/1 mottling.
92.5-99 cm	5Y3/1 silty clay.
99-109 cm	5Y3/1 sand.
109-114.5 cm	5Y3/1 silty clay to silty sand laminae; some 7.5YR2/0.
114.5-127 cm	7.5YR2/0 sand.
127-130 cm	irregular contact with clay - a large clast? 5Y3/1.
130.5-140 cm	5Y3/1 silty sand with 7.5YR2/0 mottlings.
140-151 cm	5Y3/1 sand, with 7.5YR2/0 mottling.
151-153.5 cm	5Y3.5/1 silty, sandy clay.
153.5-157 cm	5Y3/1 silty sand.
157-160 cm	5Y3/2 silty clay.
160-166.5 cm	5Y2.5/1 sand.
166.5-180 cm	5Y/1, 5Y3/2 mottled irregular laminae, with 7.5YR2/0 and intense black mottled through.
180-181 cm	5Y4/1 clay layer.
181-186 cm	5Y3/1 silty clay with 7.5YR2/0 and intense black.
186-201.5 cm	alternating bands of 5Y3/1 sands, 5Y3/2 silty clays.
201.5-235 cm	mixed, distorted layers of sand and silt and clay.

235-250 cm	less distorted, more visible layers of 5Y3.5/1 sand and 5Y4/1 clay.
250-263 cm	bands of 5Y4/1 clay mottled with 7.5YR2/0 and 5Y4/1 sands.

MC 2.2 Piston Core - 664 cm

0-30 cm	5Y4/2 silty clay, with scattered, intense black, burrows, pebble 7-9 cm.
30-32.5 cm	7.5YR2/0 sand.
32.5-100 cm	5Y4/2 silty clay, with scattered, intense black, burrows; kelp holdfast 76-77 cm.
100-101.5 cm	7.5YR2/0 sand.
101.5-116 cm	5Y4/2 silty clay, with intense black burrows.
116-119 cm	bioturbation heavier.
119-125 cm	bioturbation more blurred.
125-127 cm	bioturbation marks scattered, more distinct.
127-134 cm	5Y4/2 silty clay with intense black burrows, also mottling of 7.5YR3/0.
134-157 cm	5Y4/2 silty clay, intense black burrows scattered.
157-173 cm	5Y4/2 silty clay with finer, smaller burrows.
173-174 cm	sand, 7.5YR2/0.
174-175 cm	5Y2.5/2 silty clay.
175-181 cm	5Y4/2 silty clay, with intense black burrows.
181-182 cm	7.5YR2/0 silty sand clay.
182-184.5 cm	7.5YR2/0 sand.
184.5-185.0 cm	7.5YR2/0 silty clay.
185-190 cm	5Y4/2 silty clay, with black burrows.

190-191 cm	5Y3/2 sandy silt.
191-208.5 cm	5Y4/2 silty clay, with black burrows.
208.5-209.5 cm	5Y3/1 silty clay with black burrows.
209.5-212 cm	5Y3/1 sand.
212-213 cm	7.5YR2/0 silty clay.
213-216 cm	5Y4/2 silty clay with black burrows.
216-217.5 cm	5Y3/1 silty clay, with black burrows.
217.5-222.0 cm	7.5YR2/0 sand.
222-224 cm	5Y3/1 silt, with black burrows.
224-225 cm	7.5YR2/0 sand.
225-226 cm	7.5YR3/0 silty clay, with black burrows.
226-246 cm	5Y4/1, 5Y4/2 silty clay, with black marks and burrows oriented roughly horizontally.
246-249.5 cm	5Y4/1 silty clay laminae.
249.5-251.5 cm	5Y4/1 and 5Y4/2 silty clay, mottled.
251.5-253 cm	7.5YR2/0 sand.
253-294 cm	5Y4/1, 5Y4/2 mottled silty clay, with black burrows.
294 cm	very thin sand layer.
294-302 cm	5Y4/1 mottled silty clay with black burrows.
302 cm	thin, irregular black laminae.
302-436.5 cm	5Y4/1 silty clay, with broken, thin horizontal, black markings paralleling any visible sediments structures, becoming more visibly laminar by 381 cm.
436.5-504 cm	5Y4/1 with 7.5YR2/0 and intense black markings, more or less horizontal.
504-521 cm	more visibly laminar sediments.
521-533 cm	5Y4/1 to 7.5YR2/0 thin, blurry laminae of silty clay.

533-504 cm	5Y4/1 silty clay with bioturbation of 7.5YR2/0 and intense black.
584-606 cm	5Y4/1 to 7.5YR3/0 and 5Y4/2 laminae, at first faint, becoming more distinct.
606-611 cm	irregular layer of bioturbated silty clay, 5Y4/1 with 7.5YR2/0.
611-612 cm	5Y4/1 sand.
612-617 cm	irregular layer, bioturbated silty clay, 5Y4/1 and 7.5RY2/0.
617-626 cm	5Y4/1 to 7.5YR3/0 faint laminae.
626-633 cm	5Y4/1 to 7.5YR3/0 irregular, more distinct laminae.
633-664 cm	vertically marked sediments - sucked.

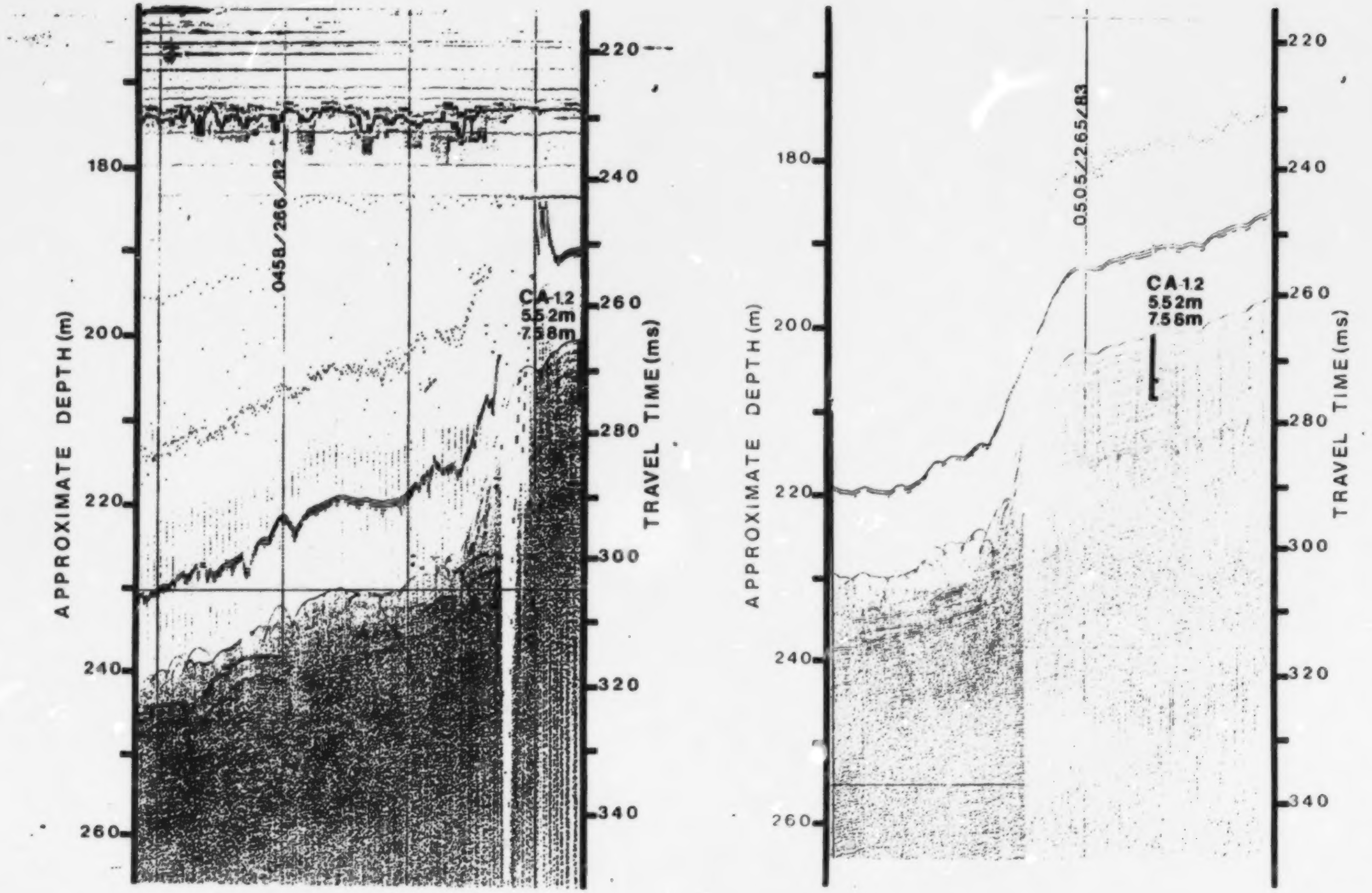

APPROXIMATE DEPTH (m)
180
200
220
240
260
TRAVEL TIME (ms)
220
240
260
280
300
320
340
0458/266/82
CA-12
5.52m
7.58m
APPROXIMATE DEPTH (m)
180
200
220
240
260
0505/265/83
CA-12
5.52m
7.56m
TRAVEL TIME (ms)
220
240
260
280
300
320
340

Figure 13.1

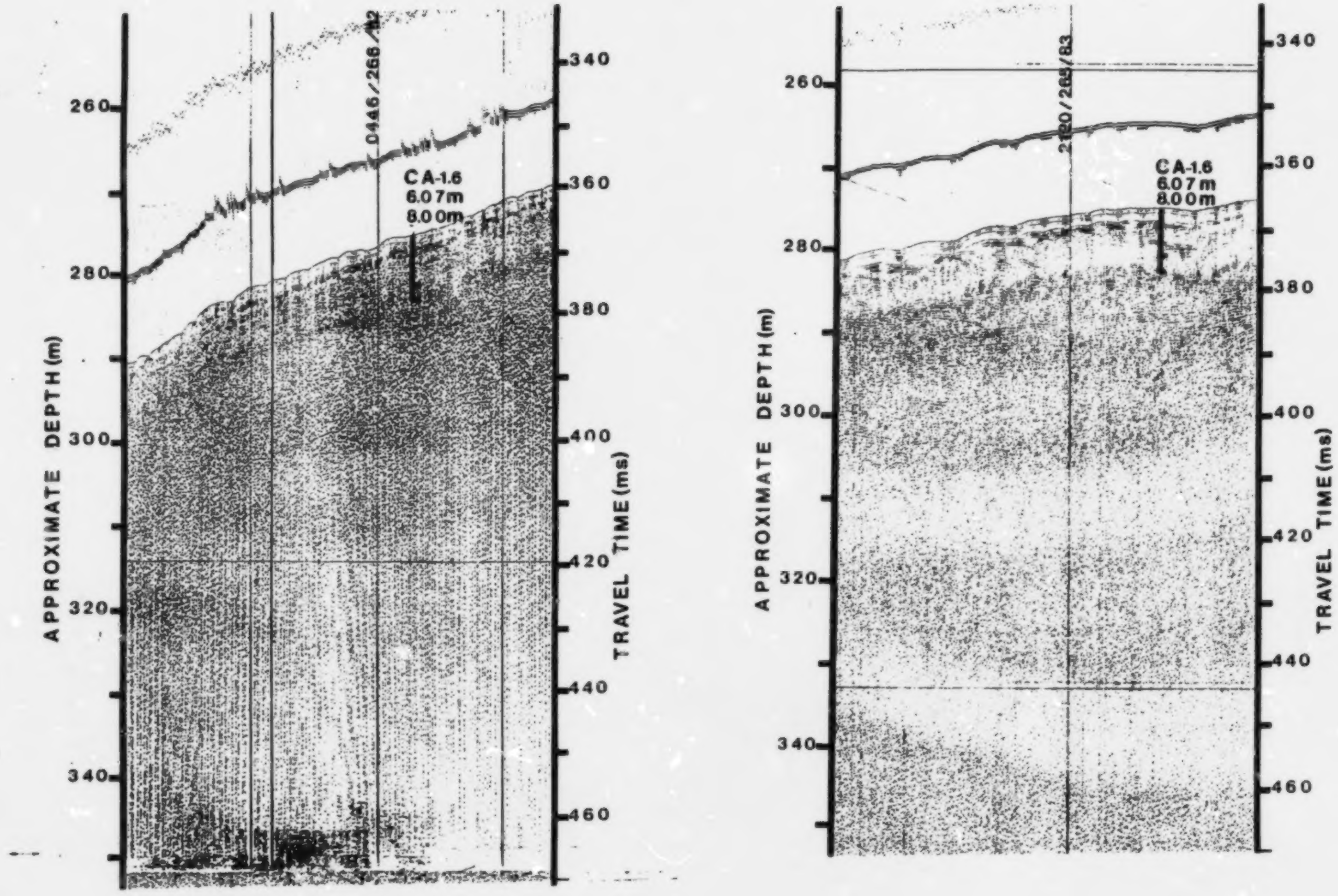

APPROXIMATE DEPTH (m)
260
280
300
320
340
TRAVEL TIME (ms)
340
360
380
400
420
440
460
0446/266/82
CA-1.6
6.07m
8.00m
APPROXIMATE DEPTH (m)
260
280
300
320
340
TRAVEL TIME (ms)
340
360
380
400
420
440
460
2120/265/83
CA-1.6
6.07m
8.00m

Figure 13.2

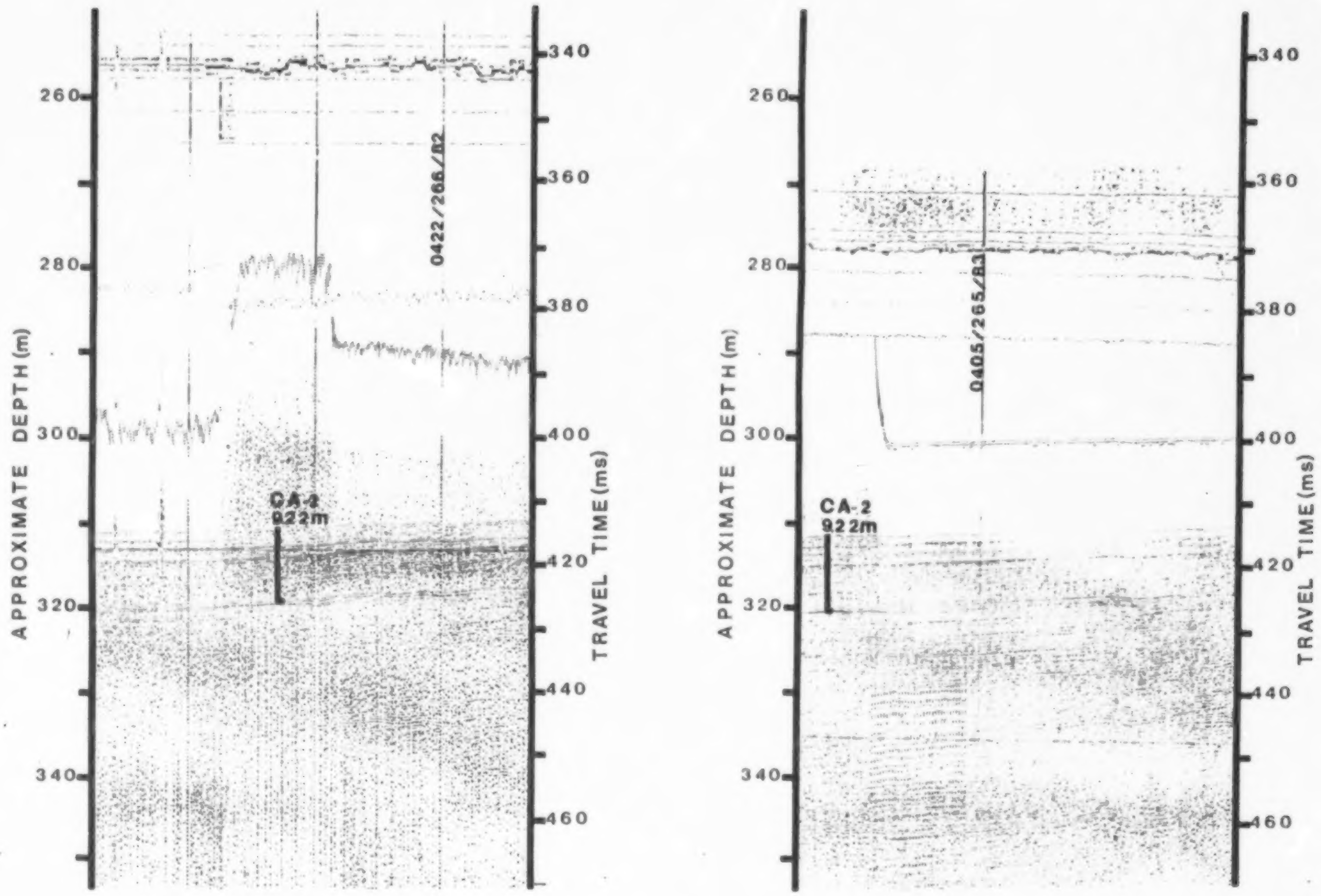

260
280
300
320
340
APPROXIMATE DEPTH (m)
340
360
380
400
420
440
460
TRAVEL TIME (ms)
0422/266/82
CA-2
922m
260
280
300
320
340
APPROXIMATE DEPTH (m)
340
360
380
400
420
440
460
TRAVEL TIME (ms)
0405/265/83
CA-2
922m

Figure 13.3

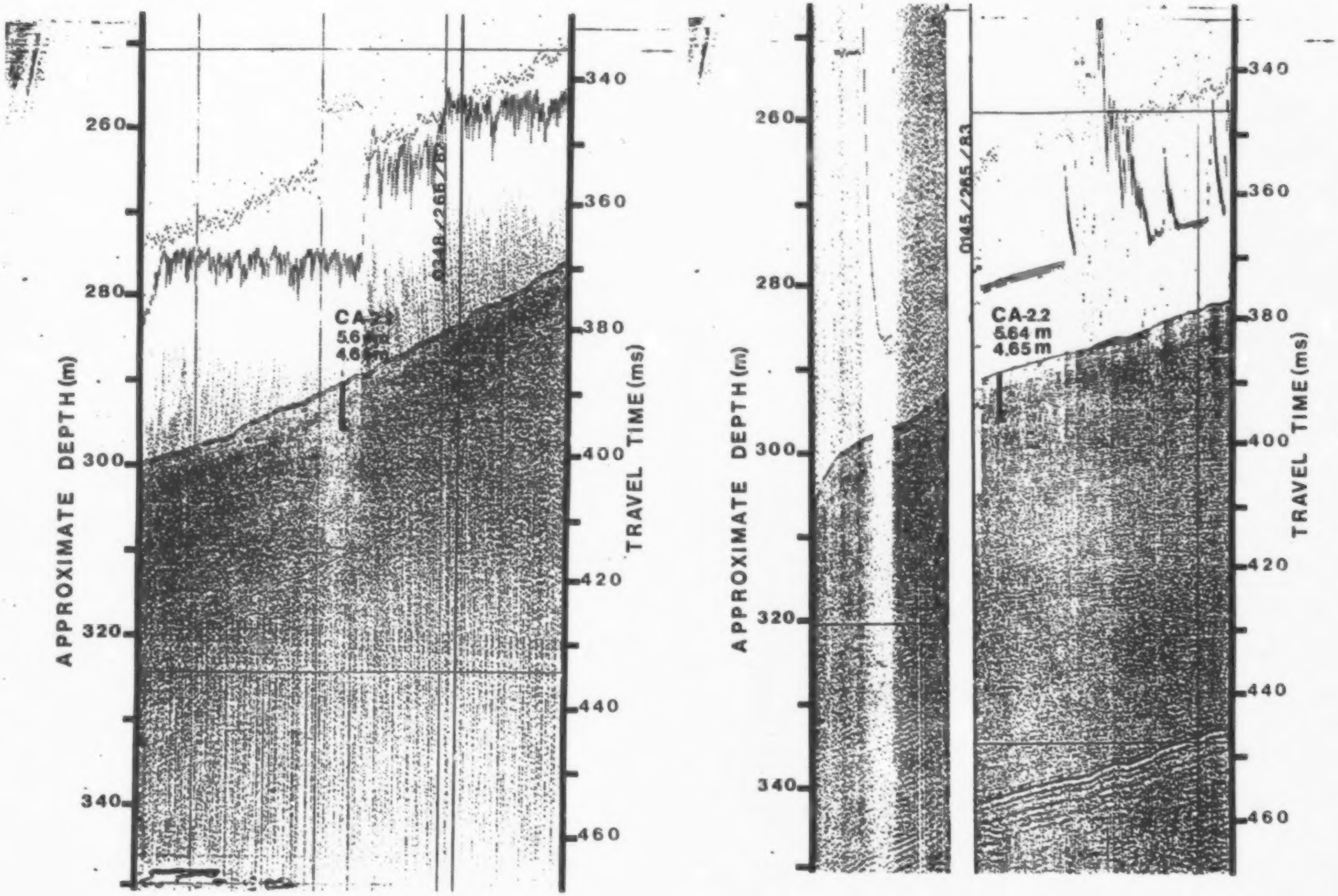

APPROXIMATE DEPTH (m)
260
280
300
320
340
TRAVEL TIME (ms)
340
360
380
400
420
440
460
0348/265/82
CA-2
5.6
4.6
0145/265/83
CA-22
5.64 m
4.65 m

Figure 13.4

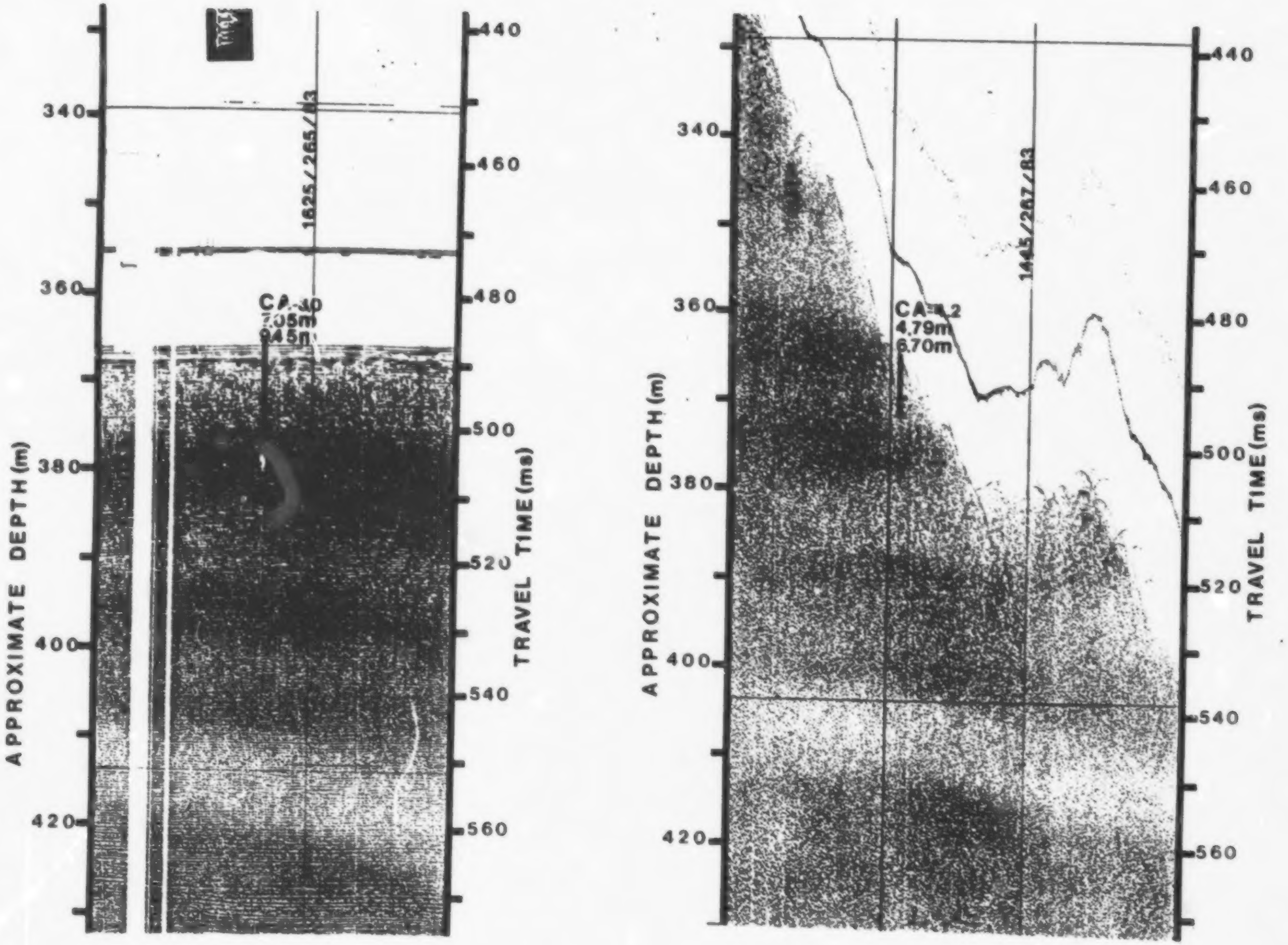

APPROXIMATE DEPTH (m)
340
360
380
400
420
TRAVEL TIME (ms)
440
460
480
500
520
540
560
1625/265/83
CA-40
7.05m
9.45m
APPROXIMATE DEPTH (m)
340
360
380
400
420
TRAVEL TIME (ms)
440
460
480
500
520
540
560
1445/267/83
CA-2
4.79m
6.70m

Figure 13.5

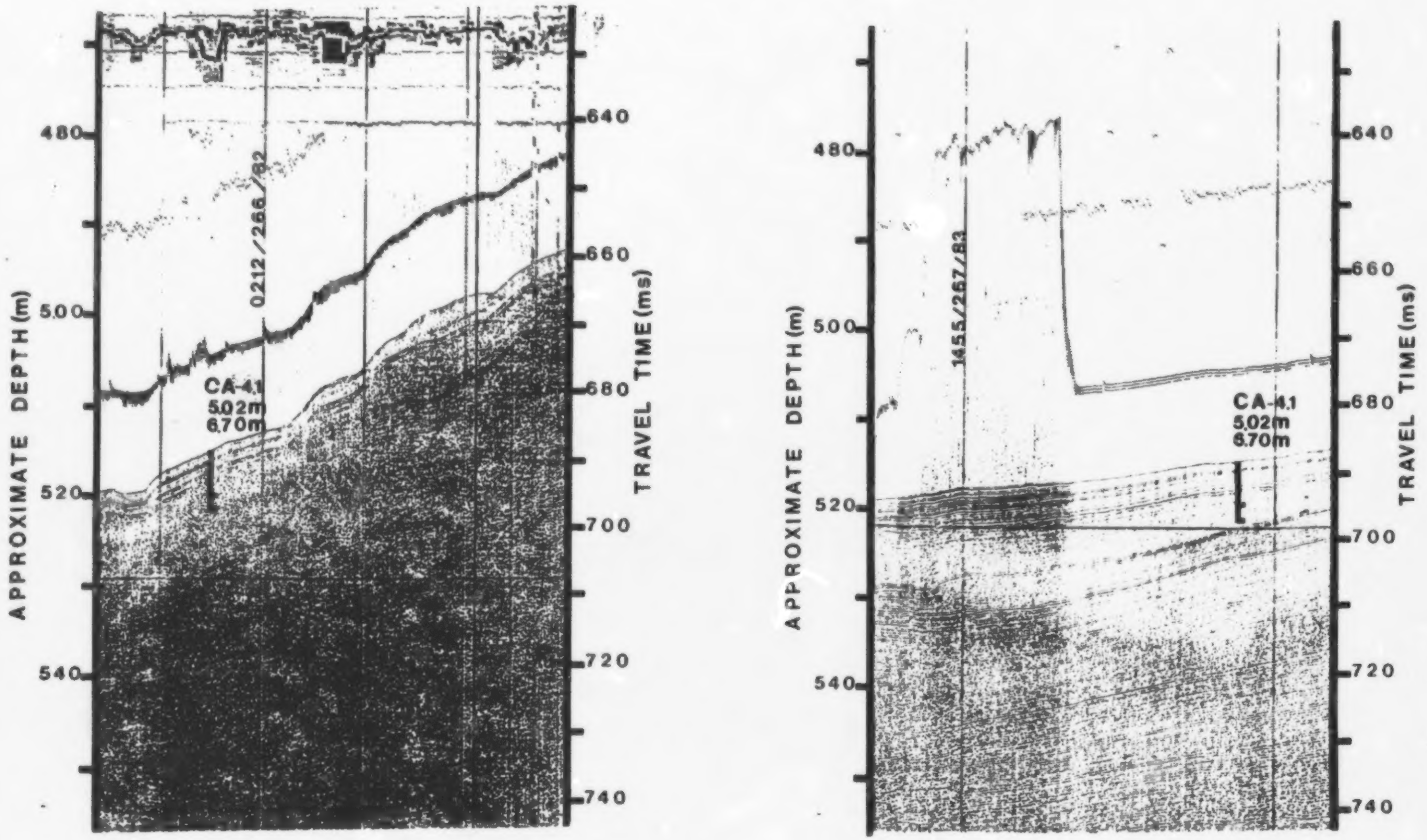

APPROXIMATE DEPTH (m)
480
500
520
540
TRAVEL TIME (ms)
640
660
680
700
720
740
0212/266/82
CA-4.1
5.02m
6.70m
APPROXIMATE DEPTH (m)
480
500
520
540
TRAVEL TIME (ms)
640
660
680
700
720
740
1455/267/83
CA-4.1
5.02m
6.70m

Figure 13.6

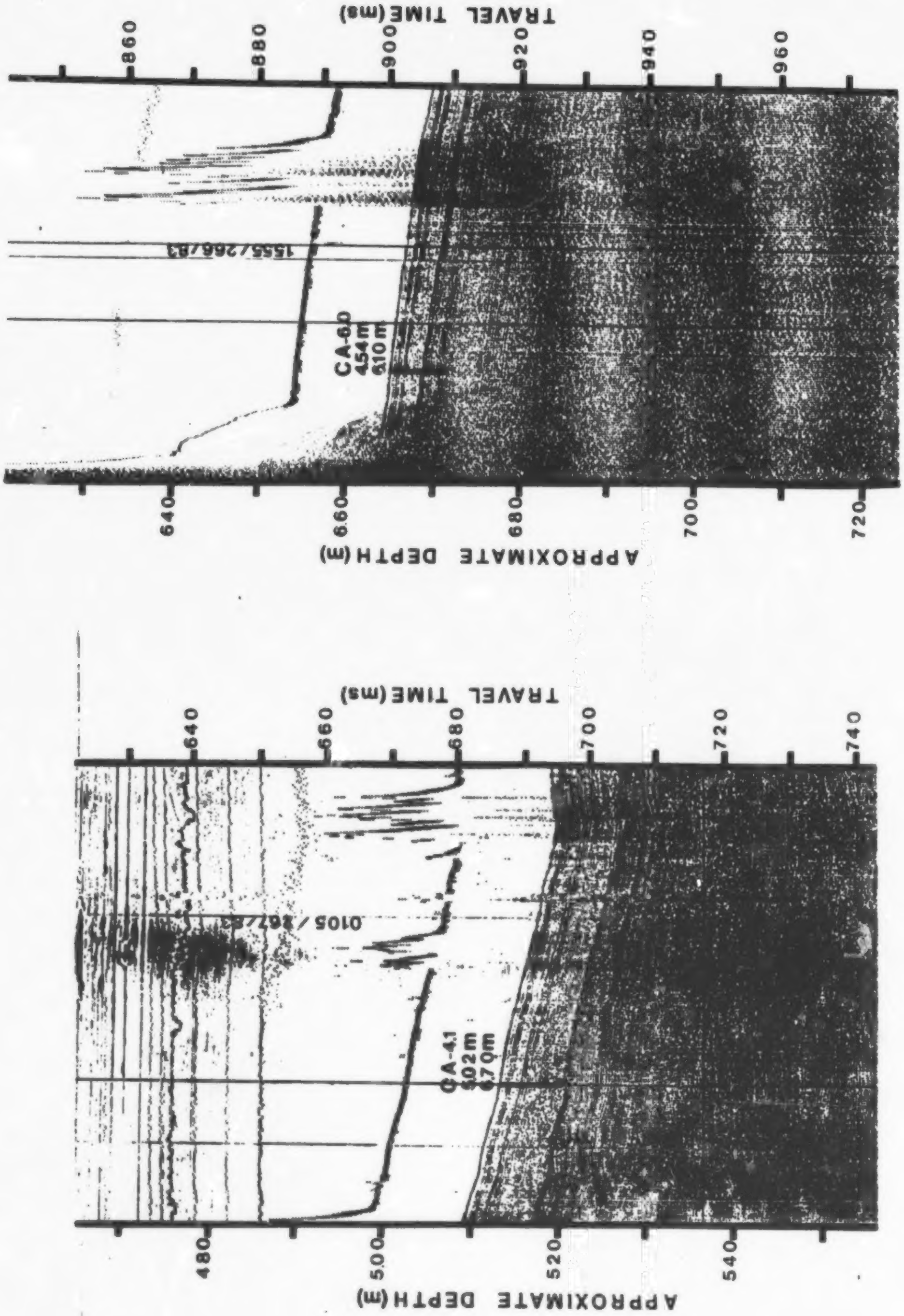

TRAVEL TIME (ms)
860
880
900
920
940
960
1555/266/83
CA-60
454m
610m
APPROXIMATE DEPTH (m)
640
660
680
700
720
TRAVEL TIME (ms)
640
660
680
700
720
740
0105/267/83
CA-41
502m
670m
APPROXIMATE DEPTH (m)
480
500
520
540

Figure 13.7

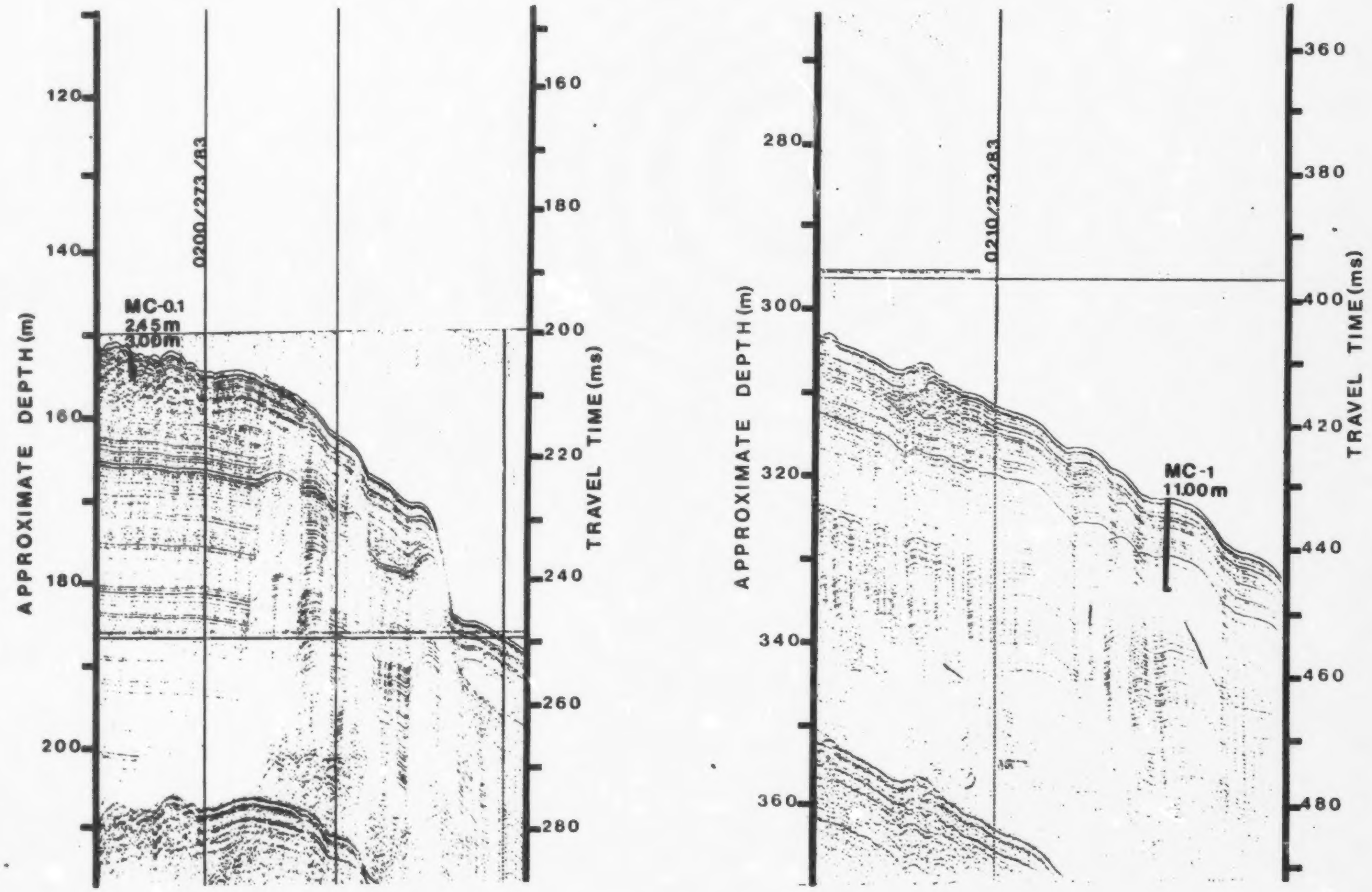

APPROXIMATE DEPTH (m)
120
140
160
180
200
TRAVEL TIME (ms)
160
180
200
220
240
260
280
0200/273/83
MC-0.1
245m
3.00m
APPROXIMATE DEPTH (m)
280
300
320
340
360
TRAVEL TIME (ms)
360
380
400
420
440
460
480
0210/273/83
MC-1
11.00m

Figure 13.8

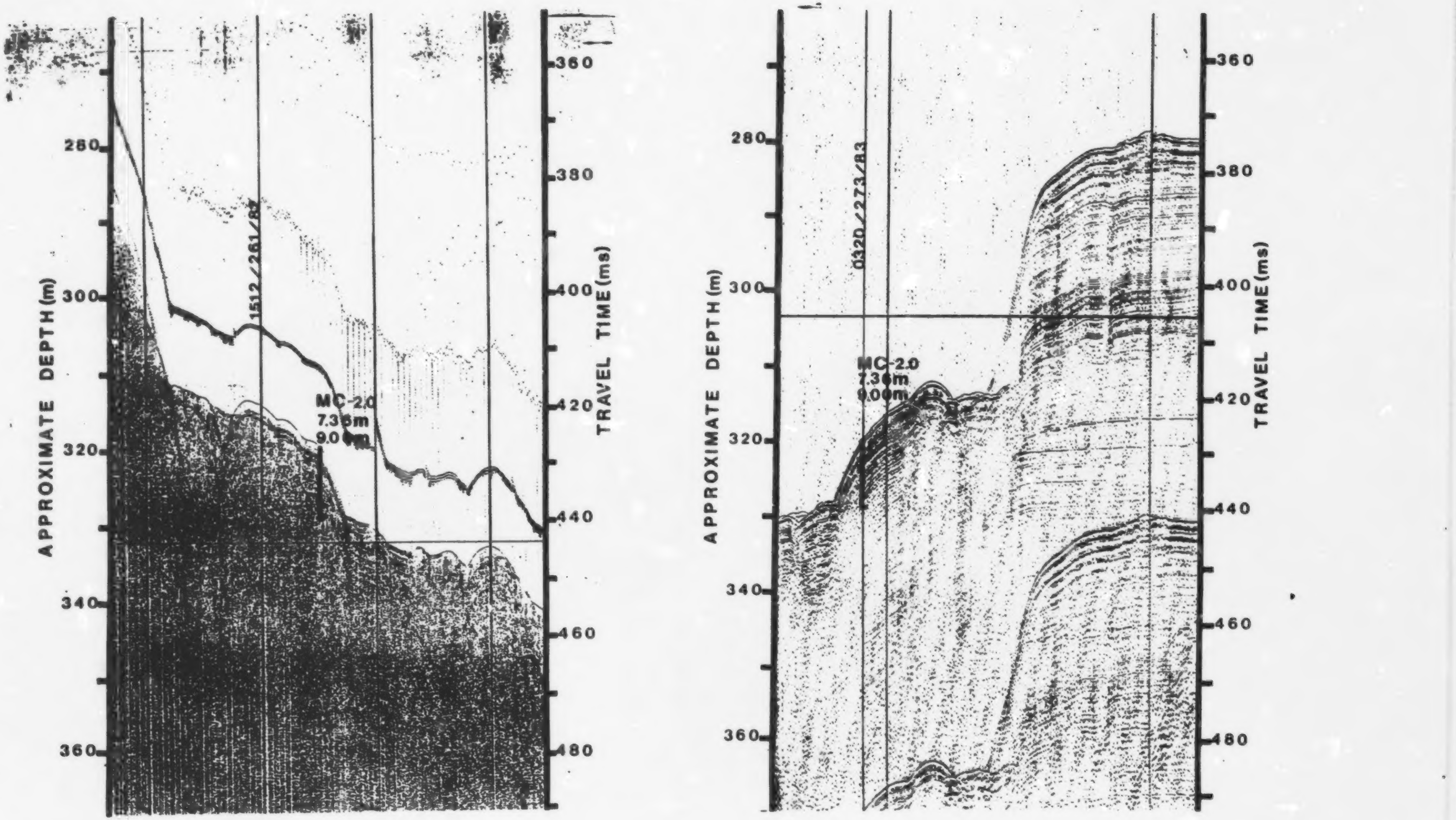

APPROXIMATE DEPTH (m)
280
300
320
340
360
TRAVEL TIME (ms)
360
380
400
420
440
460
480
1512/261/82
MC-2.0
7.36m
9.00m
0320/273/83
MC-2.0
7.36m
9.00m

Figure 13.9

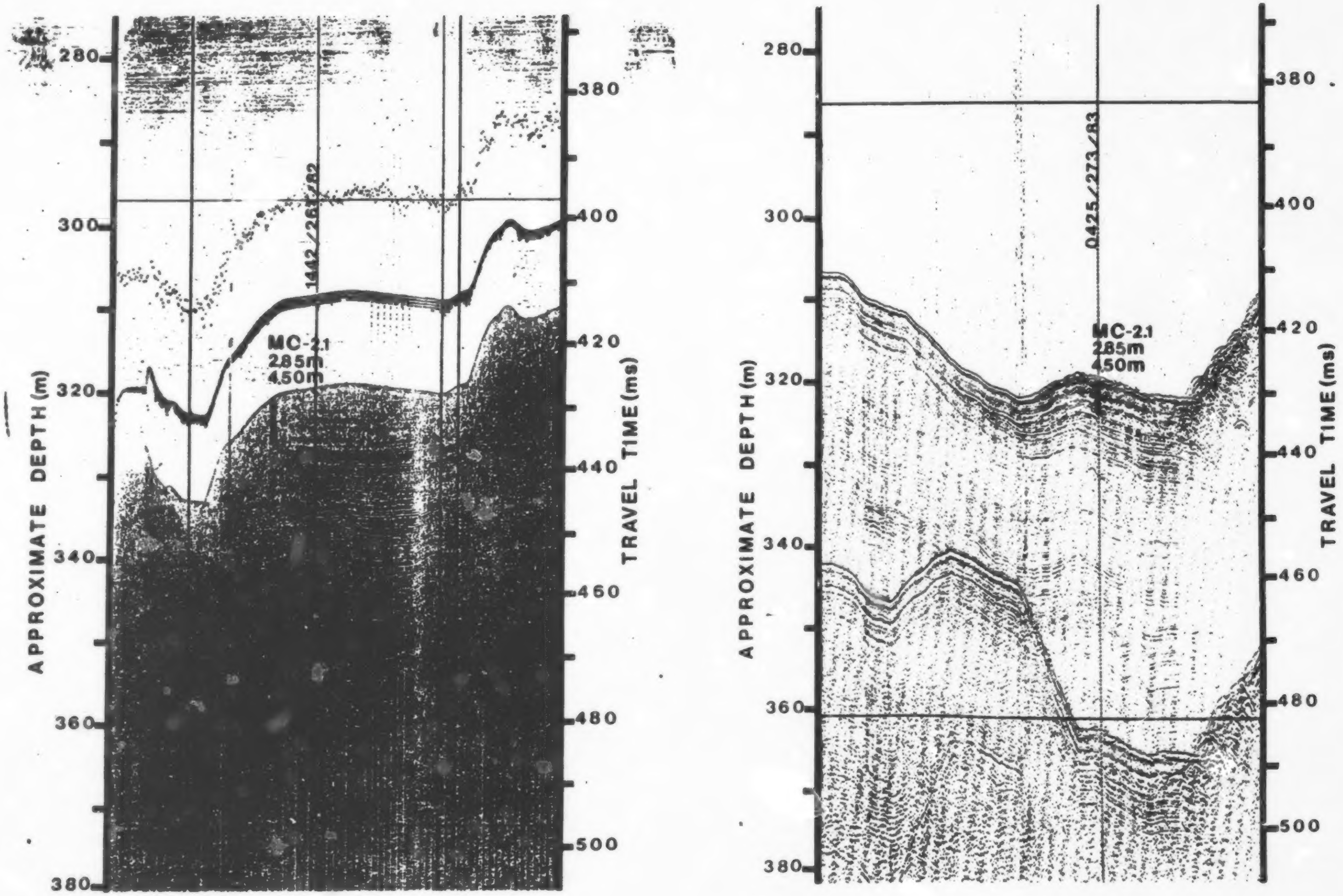

280
300
320
340
360
380
APPROXIMATE DEPTH (m)
380
400
420
440
460
480
500
TRAVEL TIME (ms)
1442/268/82
MC-2.1
285m
450m
0425/273/83
MC-2.1
285m
450m

Figure 13.10

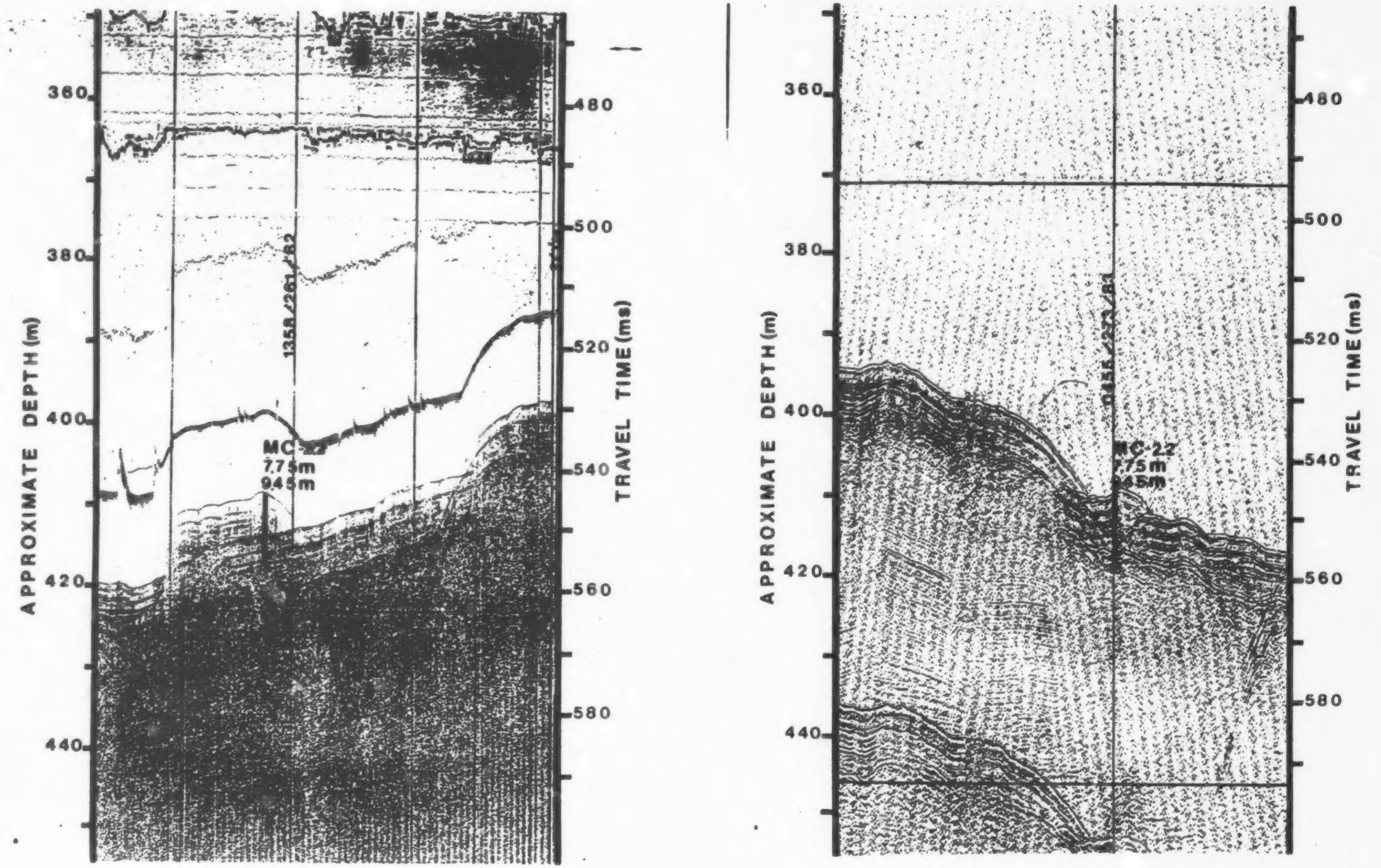

APPROXIMATE DEPTH (m)
360
380
400
420
440
TRAVEL TIME (ms)
480
500
520
540
560
580
1358/261/82
MC-22
7.75m
9.45m
APPROXIMATE DEPTH (m)
360
380
400
420
440
TRAVEL TIME (ms)
480
500
520
540
560
580
0455/273/83
MC-22
7.75m
9.45m

Figure 13.11

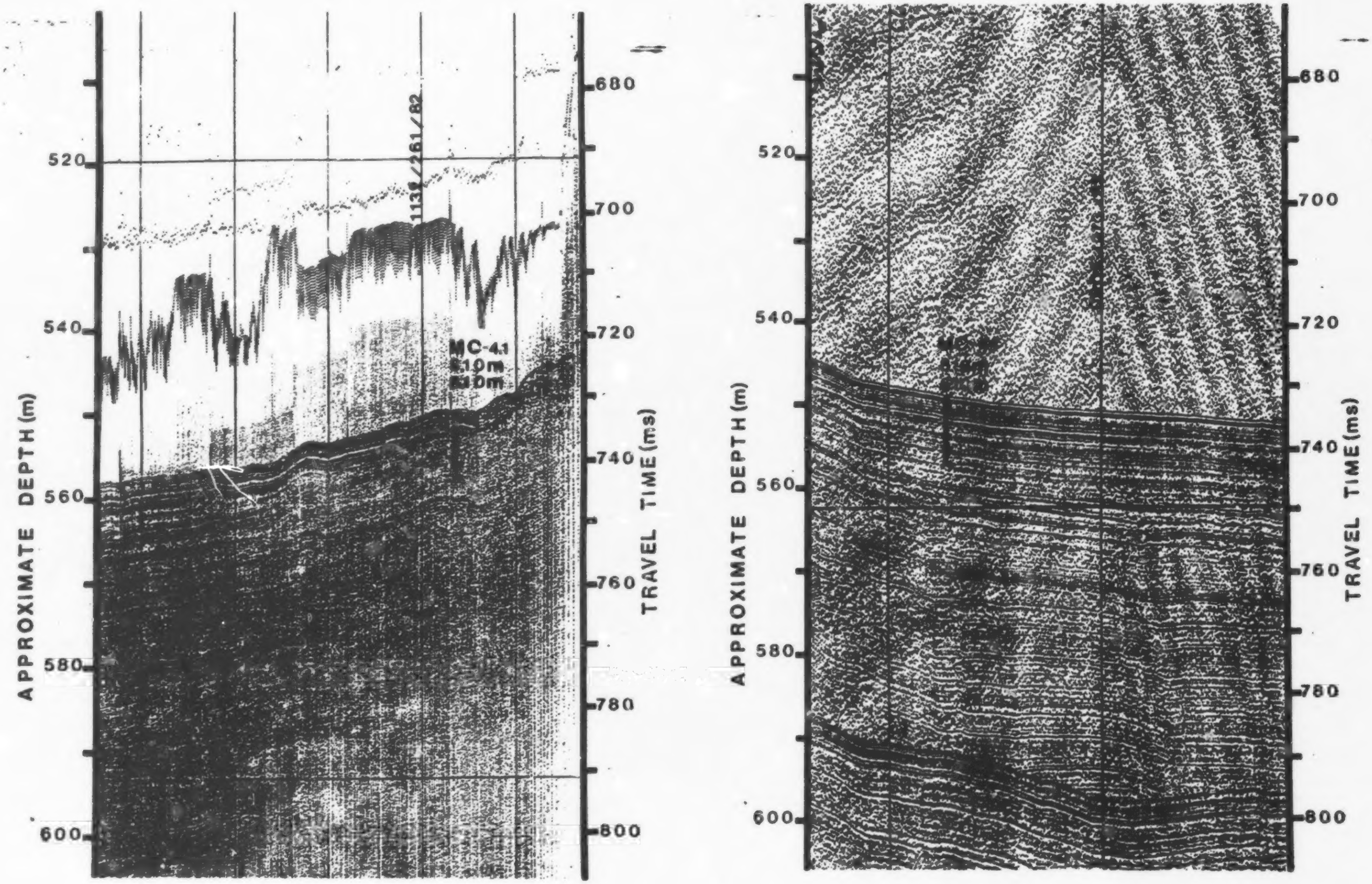

APPROXIMATE DEPTH (m)
520
540
560
580
600
TRAVEL TIME (ms)
680
700
720
740
760
780
800
1138/261/82
MC-41
510m
APPROXIMATE DEPTH (m)
520
540
560
580
600
TRAVEL TIME (ms)
680
700
720
740
760
780
800

Figure 13.12

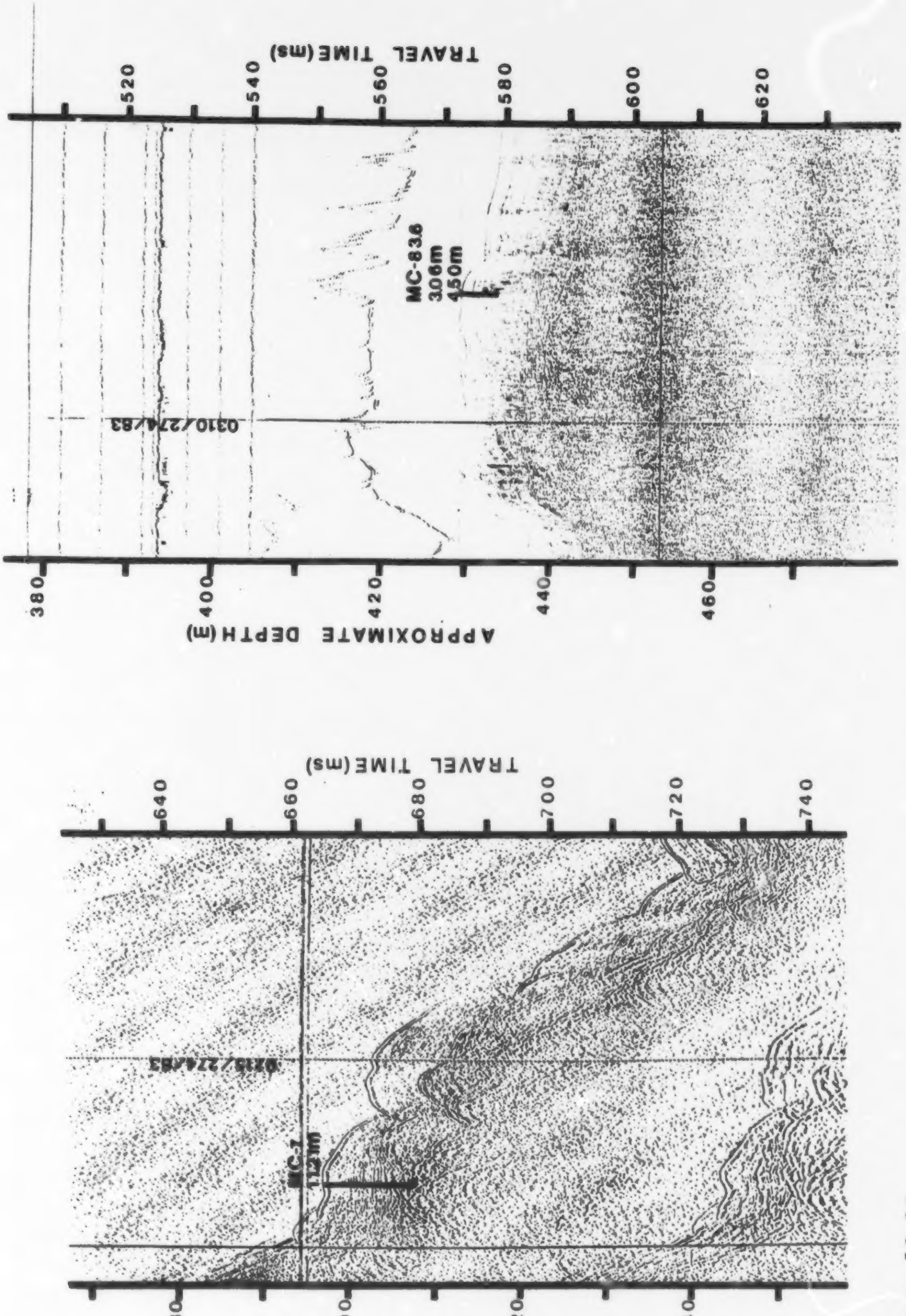

TRAVEL TIME (ms)
520
540
560
580
600
620
APPROXIMATE DEPTH (m)
380
400
420
440
460
0310/274/83
MC-836
306m
450m
TRAVEL TIME (ms)
640
660
680
700
720
740
APPROXIMATE DEPTH (m)
480
500
520
540
0215/274/83
MC-1
112m

Figure 13.13

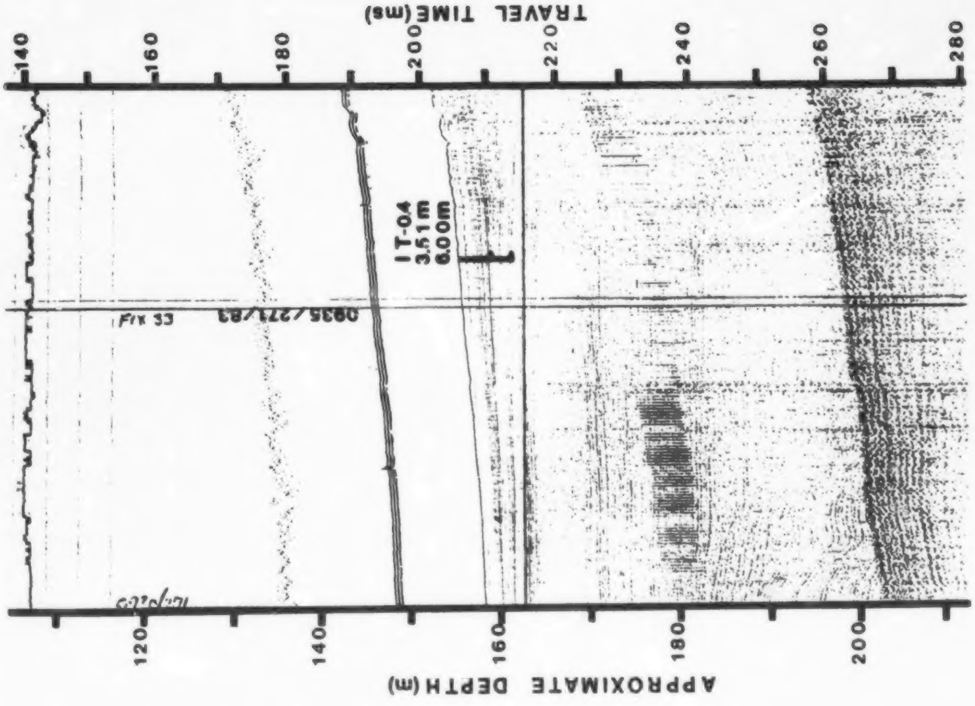

TRAVEL TIME (ms)
140
160
180
200
220
240
260
280
APPROXIMATE DEPTH (m)
120
140
160
180
200
IT-04
3.51m
6.00m
Fix 33
0935/271/83

Figure 13.14

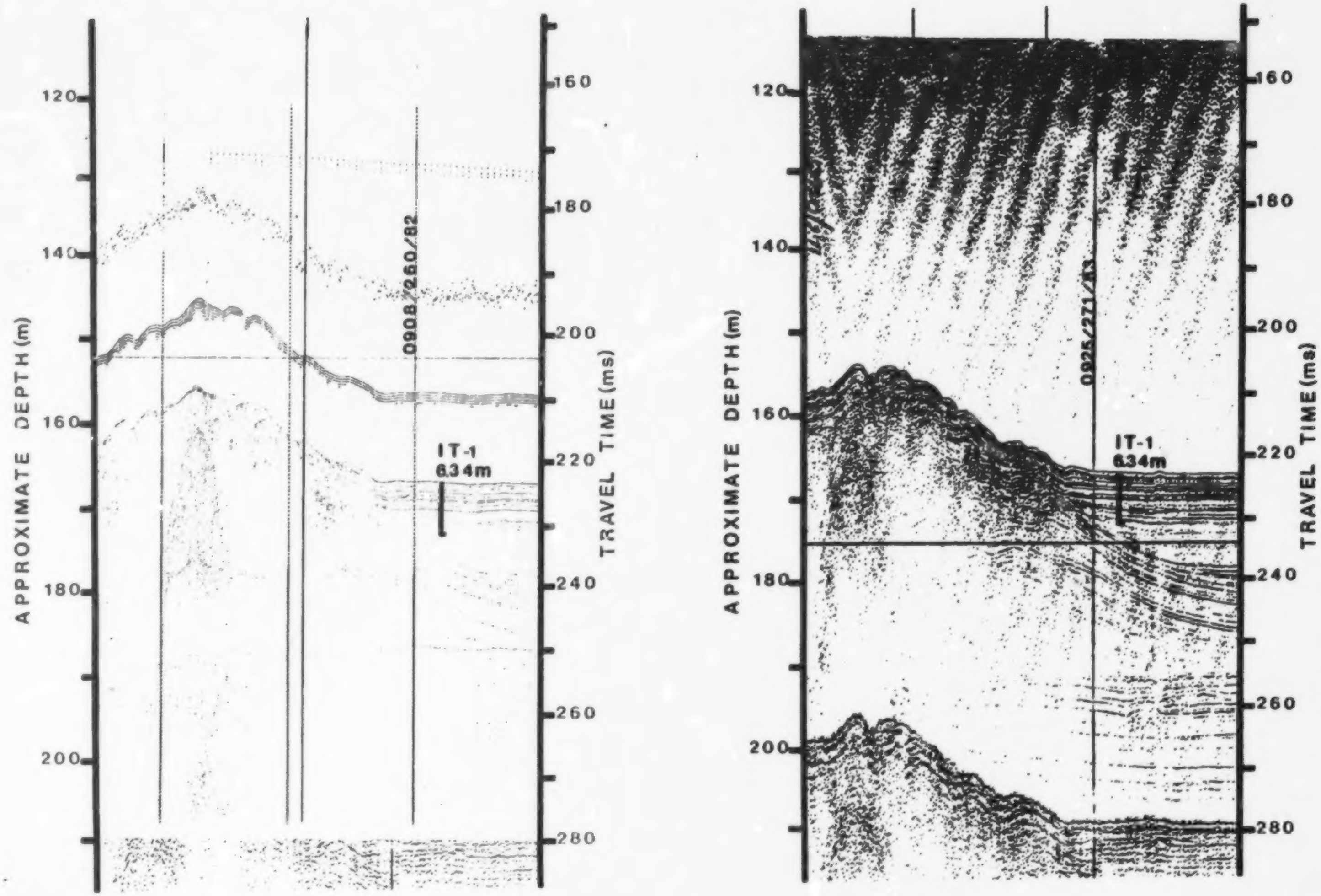
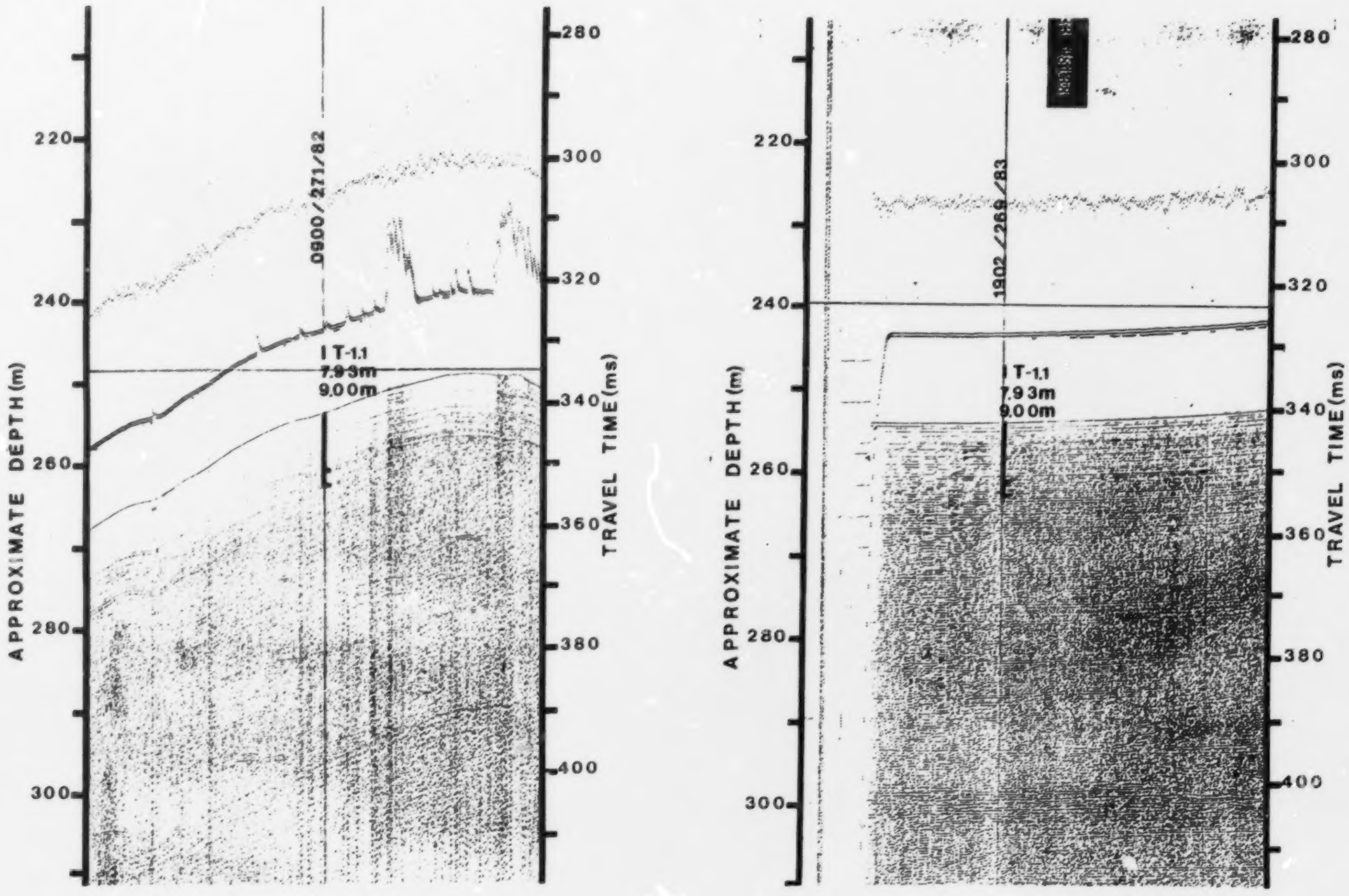

APPROXIMATE DEPTH (m)
120
140
160
180
200
TRAVEL TIME (ms)
160
180
200
220
240
260
280
0908/260/82
IT-1
6.34m
0925/271/83

Figure 13.15



APPROXIMATE DEPTH (m)
220
240
260
280
300
TRAVEL TIME (ms)
280
300
320
340
360
380
400
0900 / 271 / 82
I T-1.1
7.93m
9.00m
1902 / 269 / 83

Figure 13.16

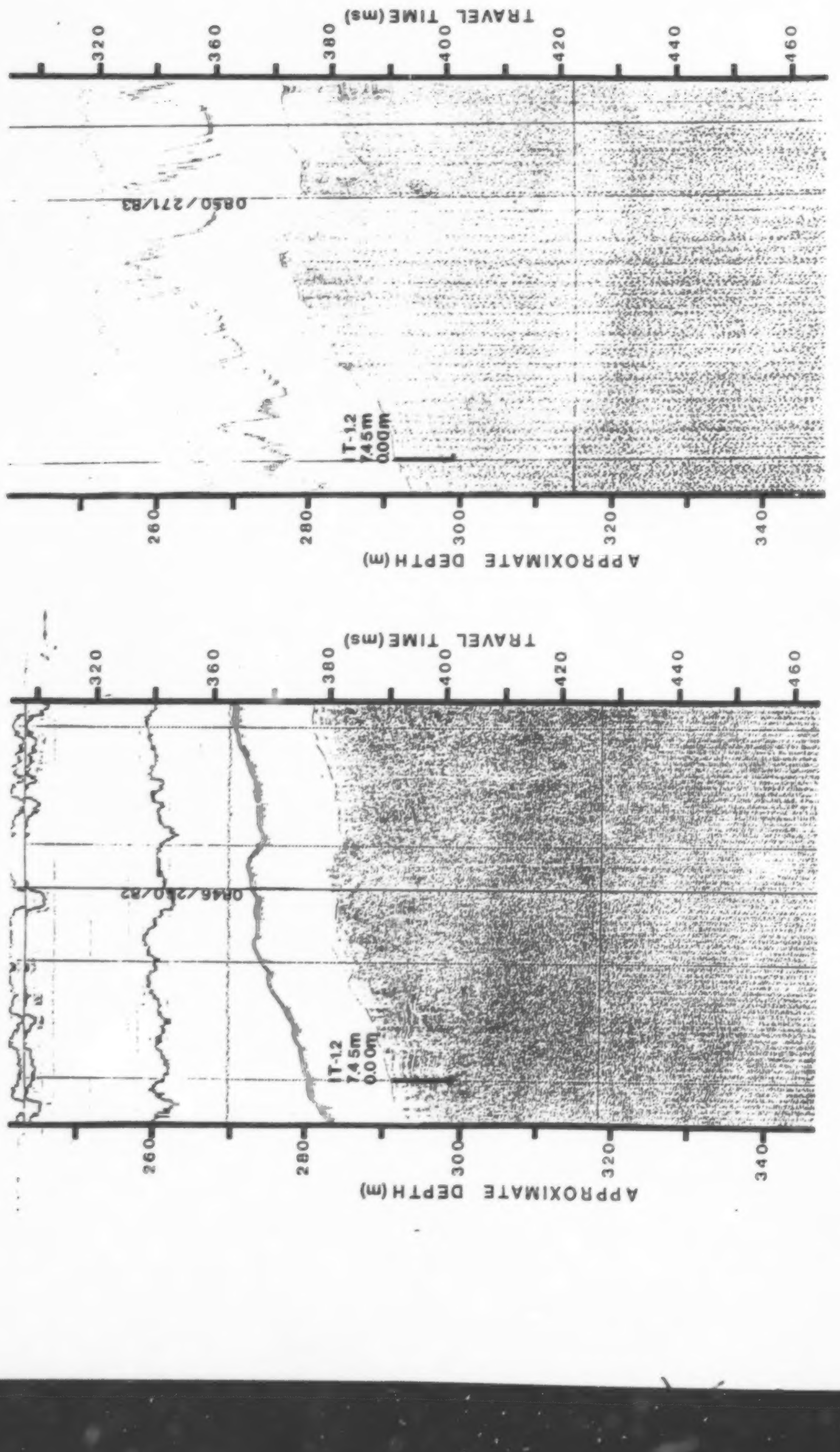

TRAVEL TIME (ms)
320
360
380
400
420
440
460
APPROXIMATE DEPTH (m)
260
280
300
320
340
0850/271/83
T-12
7.45m
0.00m
TRAVEL TIME (ms)
320
360
380
400
420
440
460
APPROXIMATE DEPTH (m)
260
280
300
320
340
T-12
7.45m
0.00m

Figure 13.17

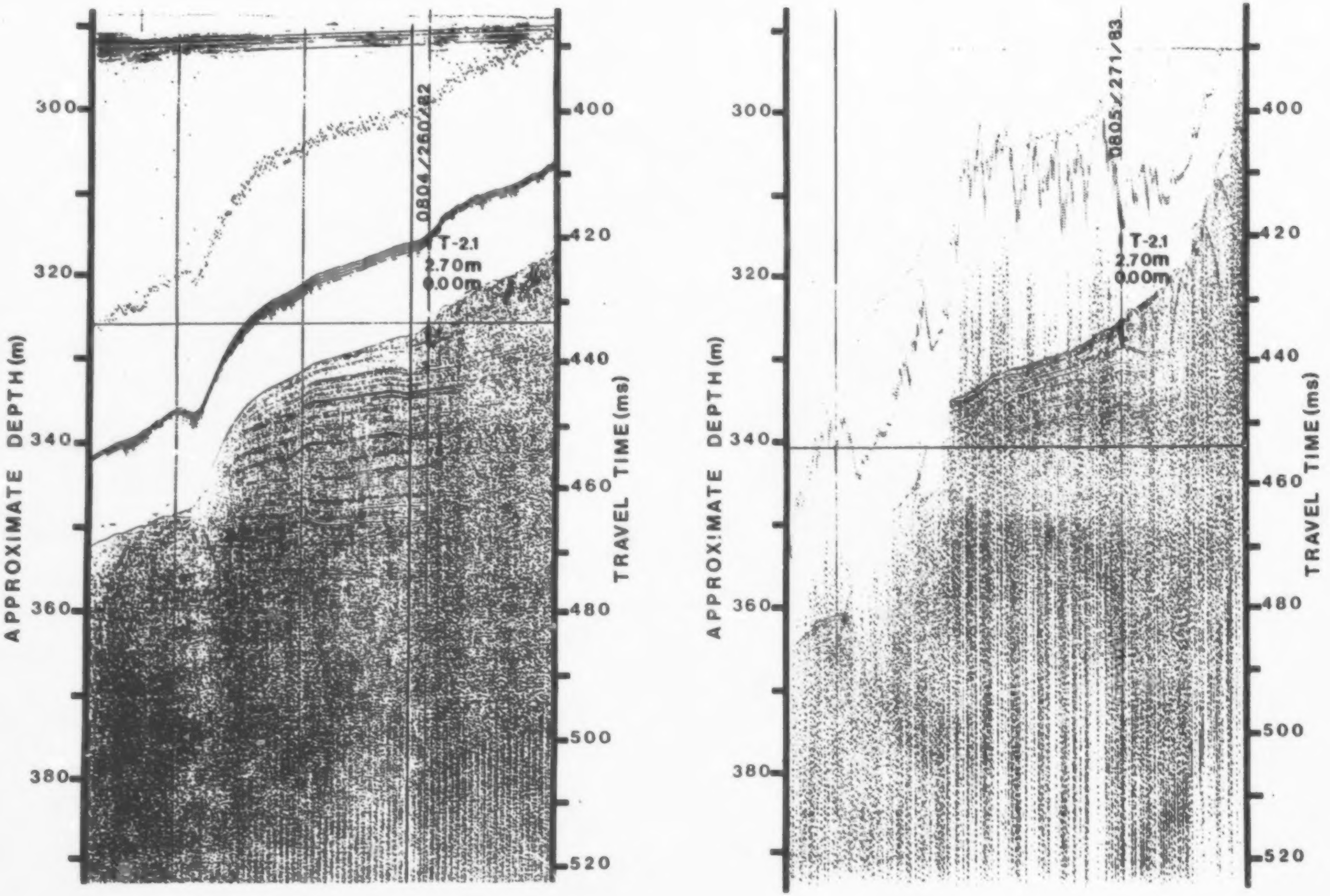

APPROXIMATE DEPTH (m)
300
320
340
360
380
TRAVEL TIME (ms)
400
420
440
460
480
500
520
0804/260/82
T-2.1
2.70m
0.00m
0805/271/83

Figure 13.18

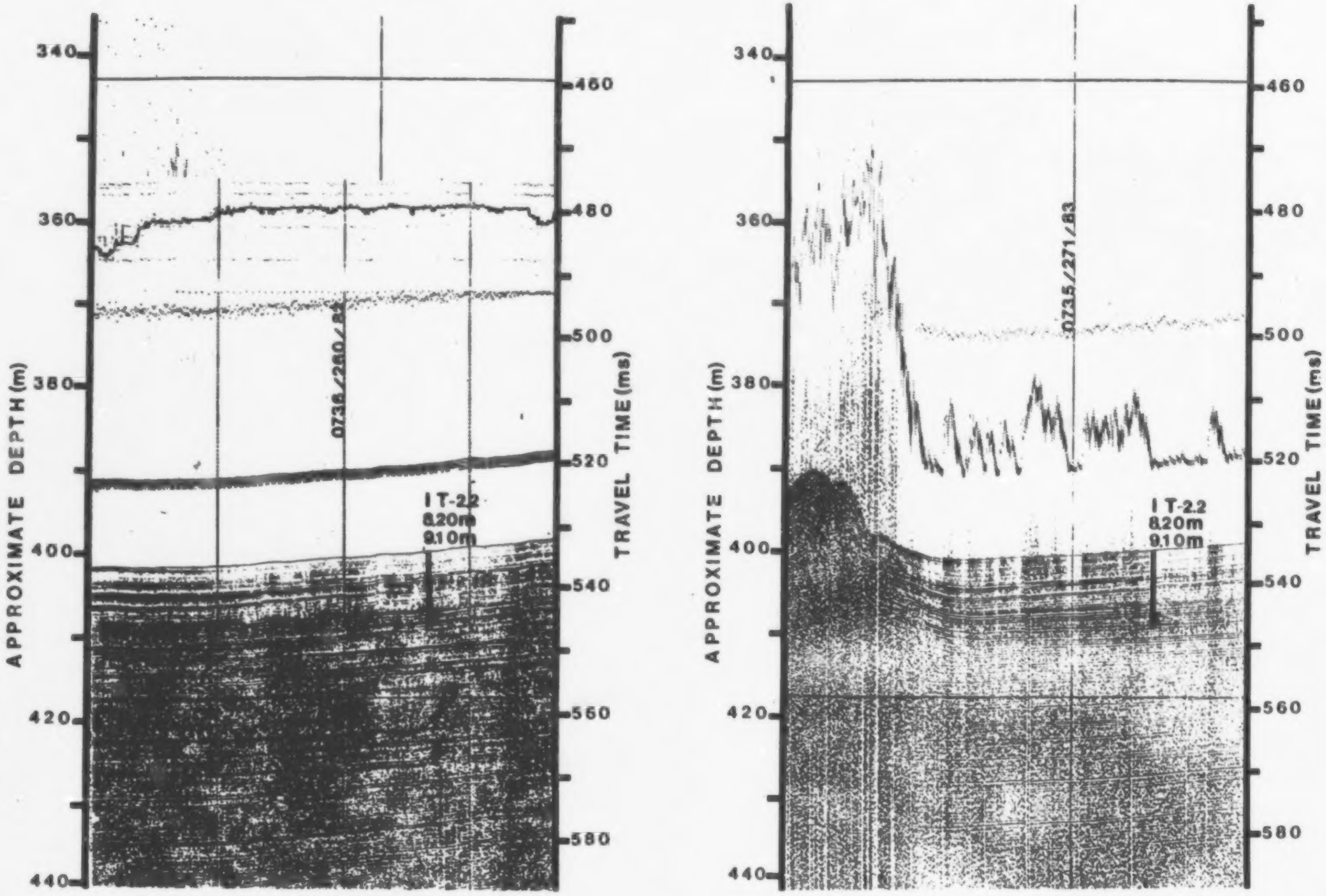

APPROXIMATE DEPTH (m)
340
360
380
400
420
440
TRAVEL TIME (ms)
460
480
500
520
540
560
580
0736/260/83
I T-2.2
8.20m
9.10m
APPROXIMATE DEPTH (m)
340
360
380
400
420
440
TRAVEL TIME (ms)
460
480
500
520
540
560
580
0735/271/83
I T-2.2
8.20m
9.10m

Figure 13.19

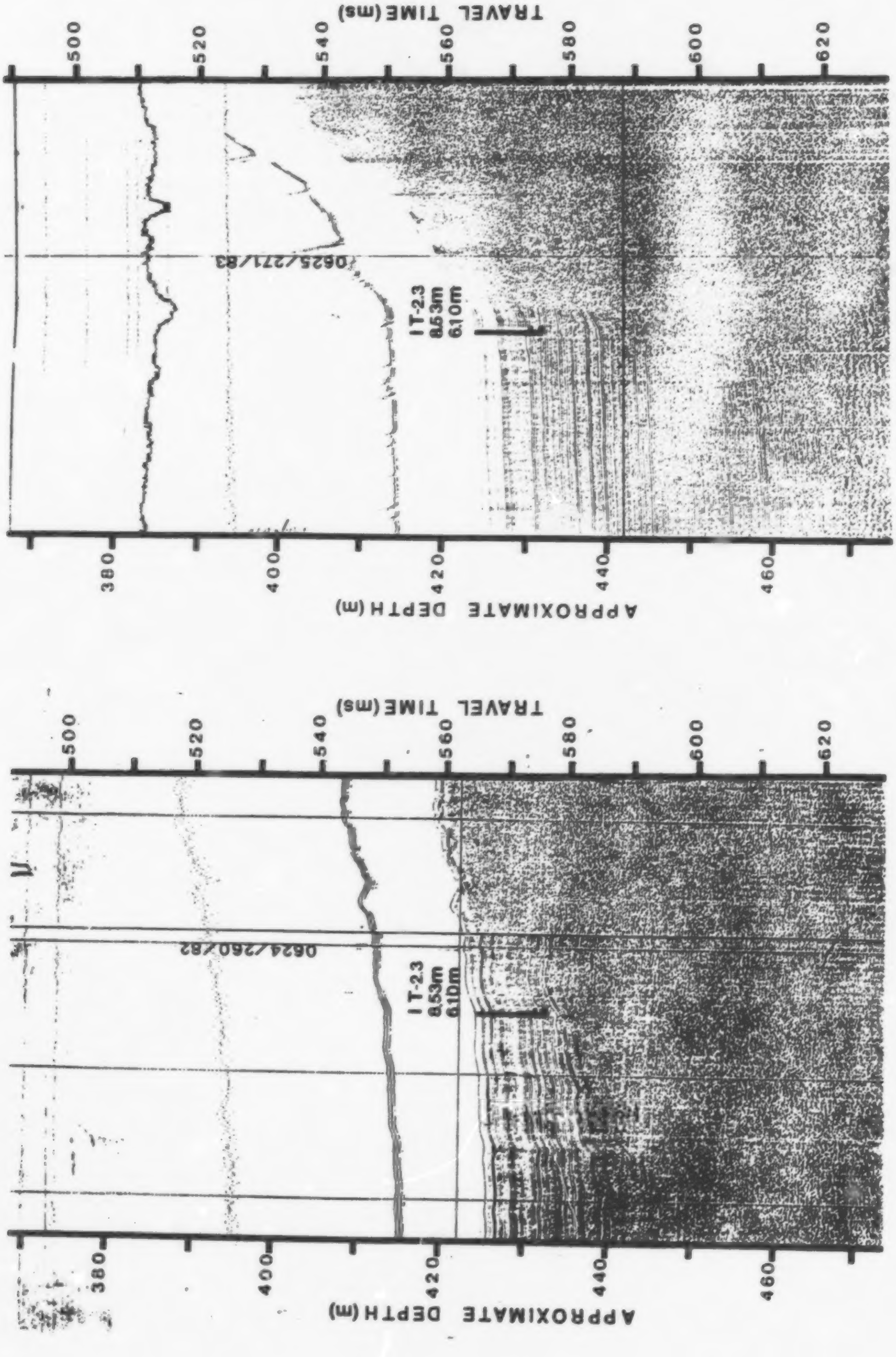

TRAVEL TIME (ms)
500
520
540
560
580
600
620
APPROXIMATE DEPTH (m)
380
400
420
440
460
0625/271/83
IT-2.3
8.53m
6.10m
0624/260/82

Figure 13.20

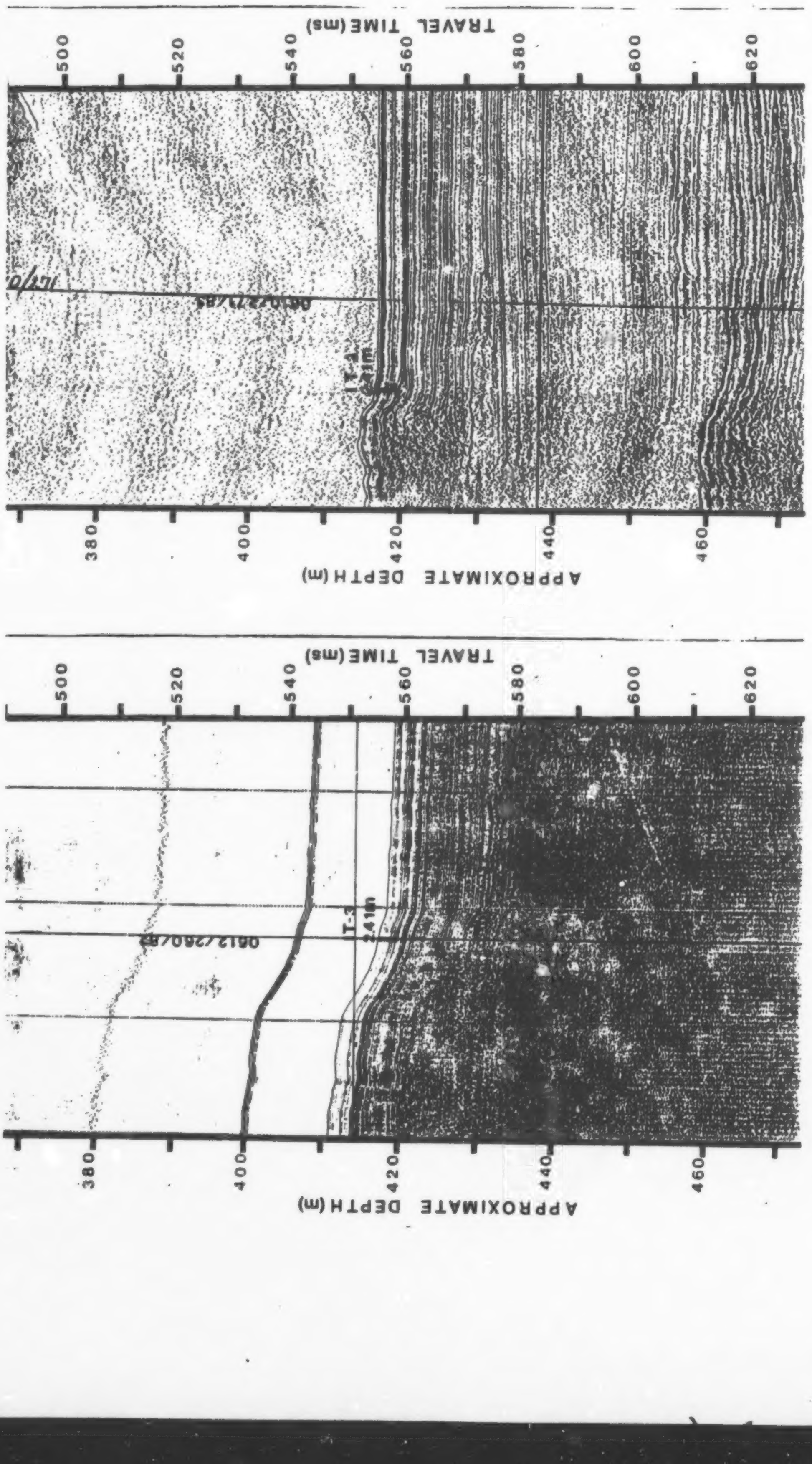

TRAVEL TIME(ms)
500
520
540
560
580
600
620
APPROXIMATE DEPTH(m)
380
400
420
440
460
0610/273/85
T-4
2.41m
0612/260/85
T-3
2.41m

Figure 13.21

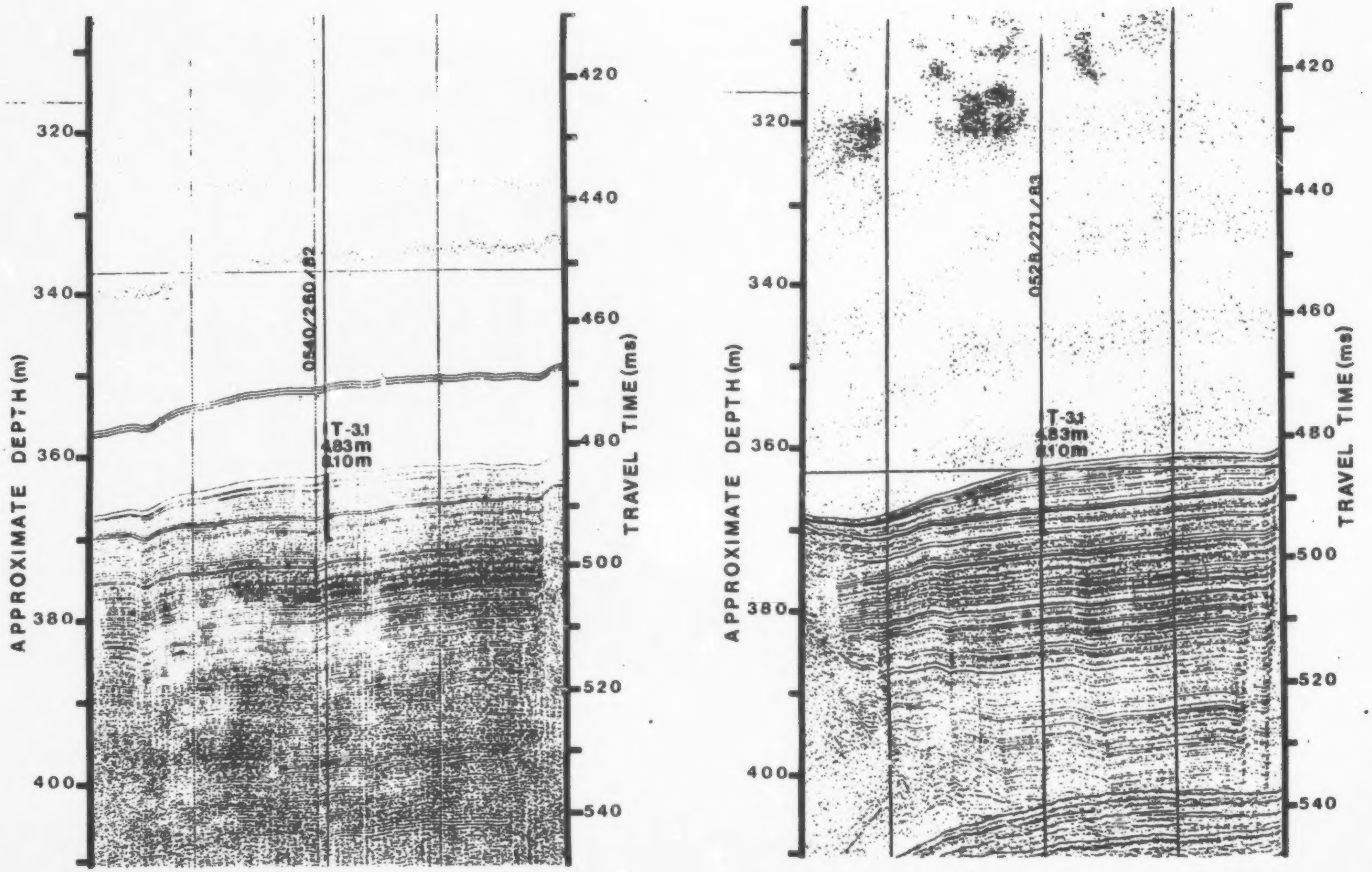

APPROXIMATE DEPTH (m)
320
340
360
380
400
TRAVEL TIME (ms)
420
440
460
480
500
520
540
0540/260/82
T-3.1
483m
610m
APPROXIMATE DEPTH (m)
320
340
360
380
400
TRAVEL TIME (ms)
420
440
460
480
500
520
540
0528/271/83
T-3.1
483m
610m

Figure 13.22

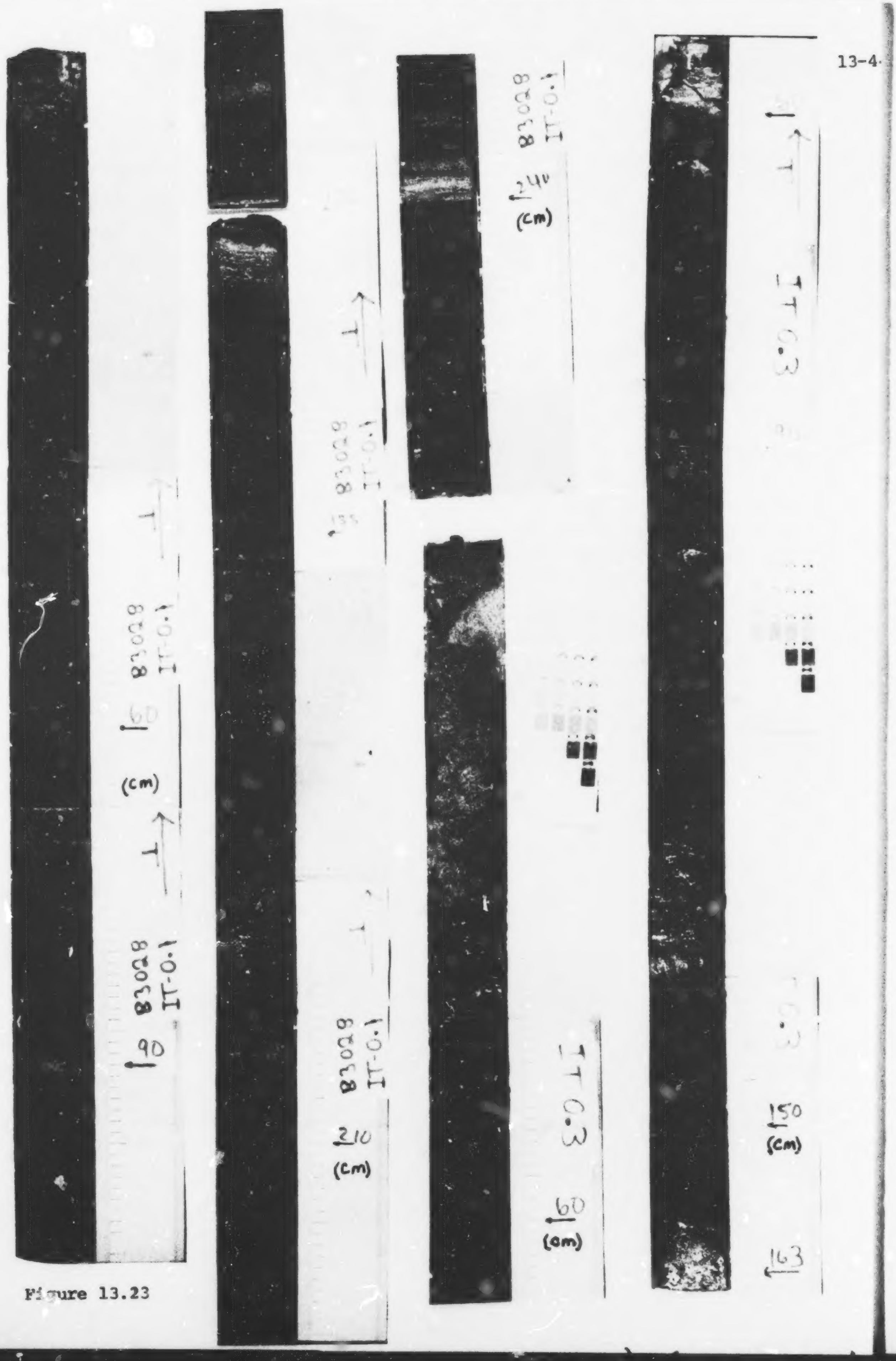
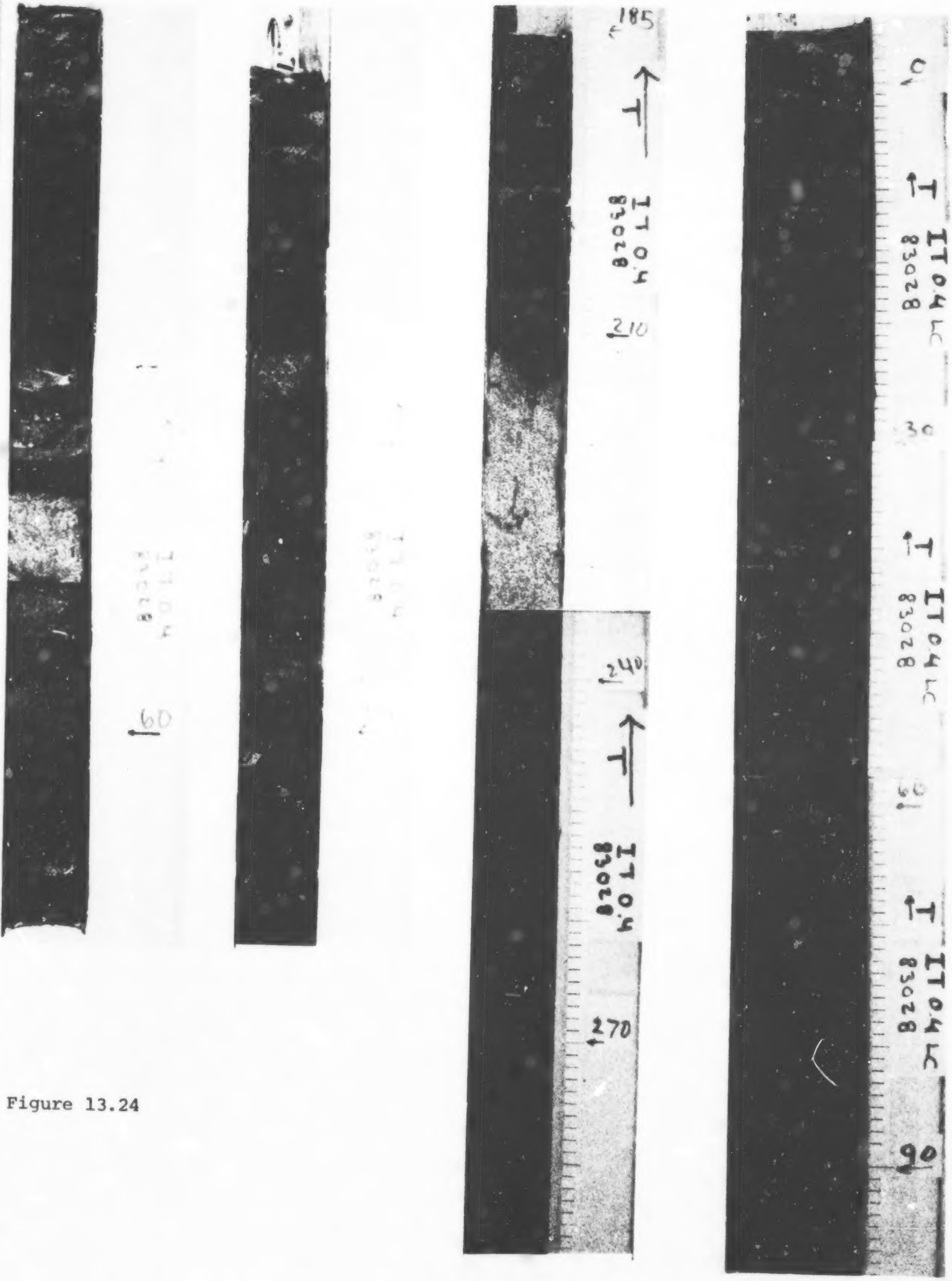

90
83028
IT-0.1
(cm)
60
83028
IT-0.1
210
(cm)
83028
IT-0.1
33
83028
IT-0.1
240
(cm)
83028
IT-0.1
60
(cm)
IT 0.3
150
(cm)
163
IT 0.3
IT 0.3

Figure 13.23



185
IT 0.4
83028
210
240
IT 0.4
83028
270
0
IT04 LC
83028
30
IT04 LC
83028
60
IT04 LC
83028
90
60

Figure 13.24

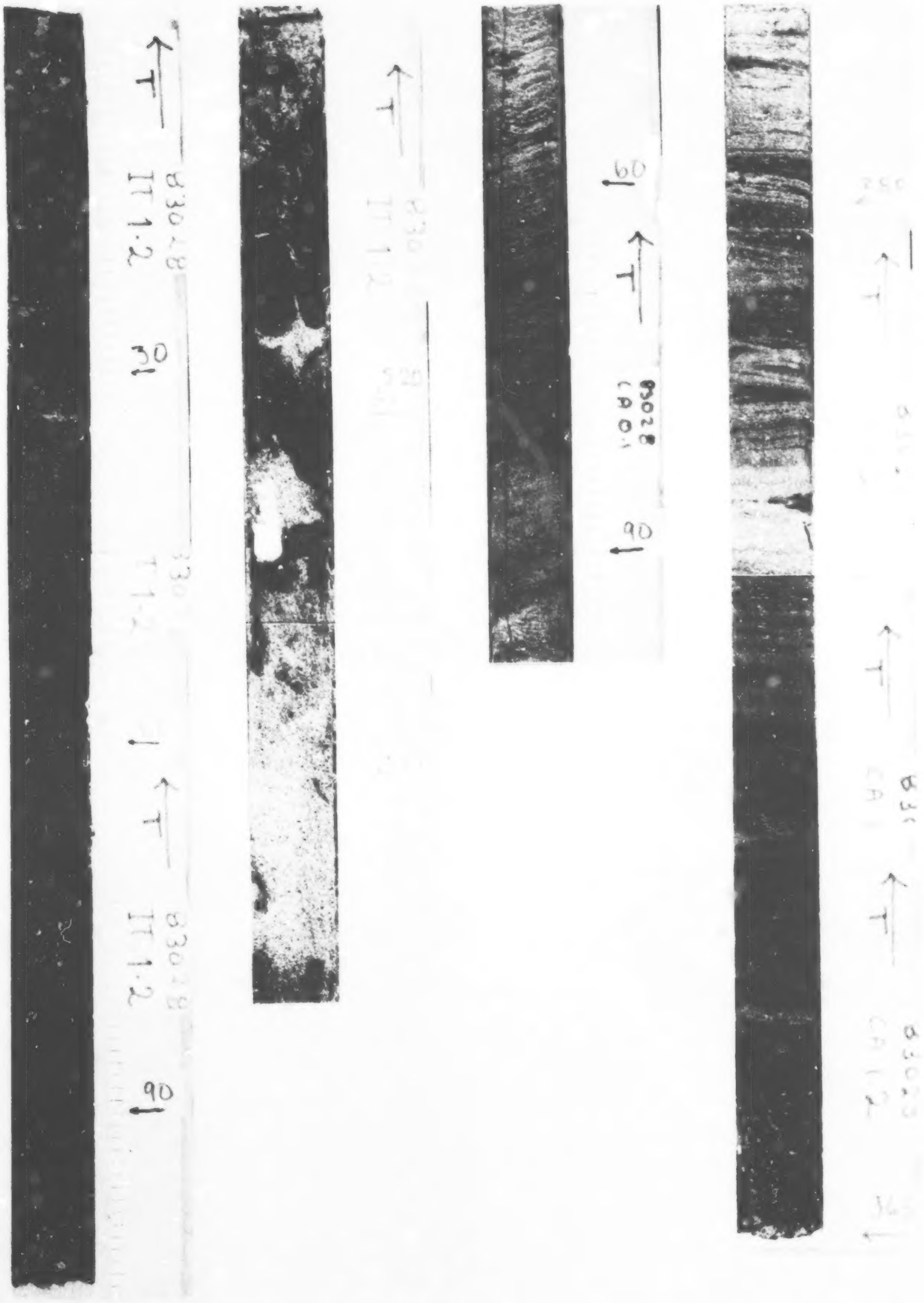


Figure 13.25

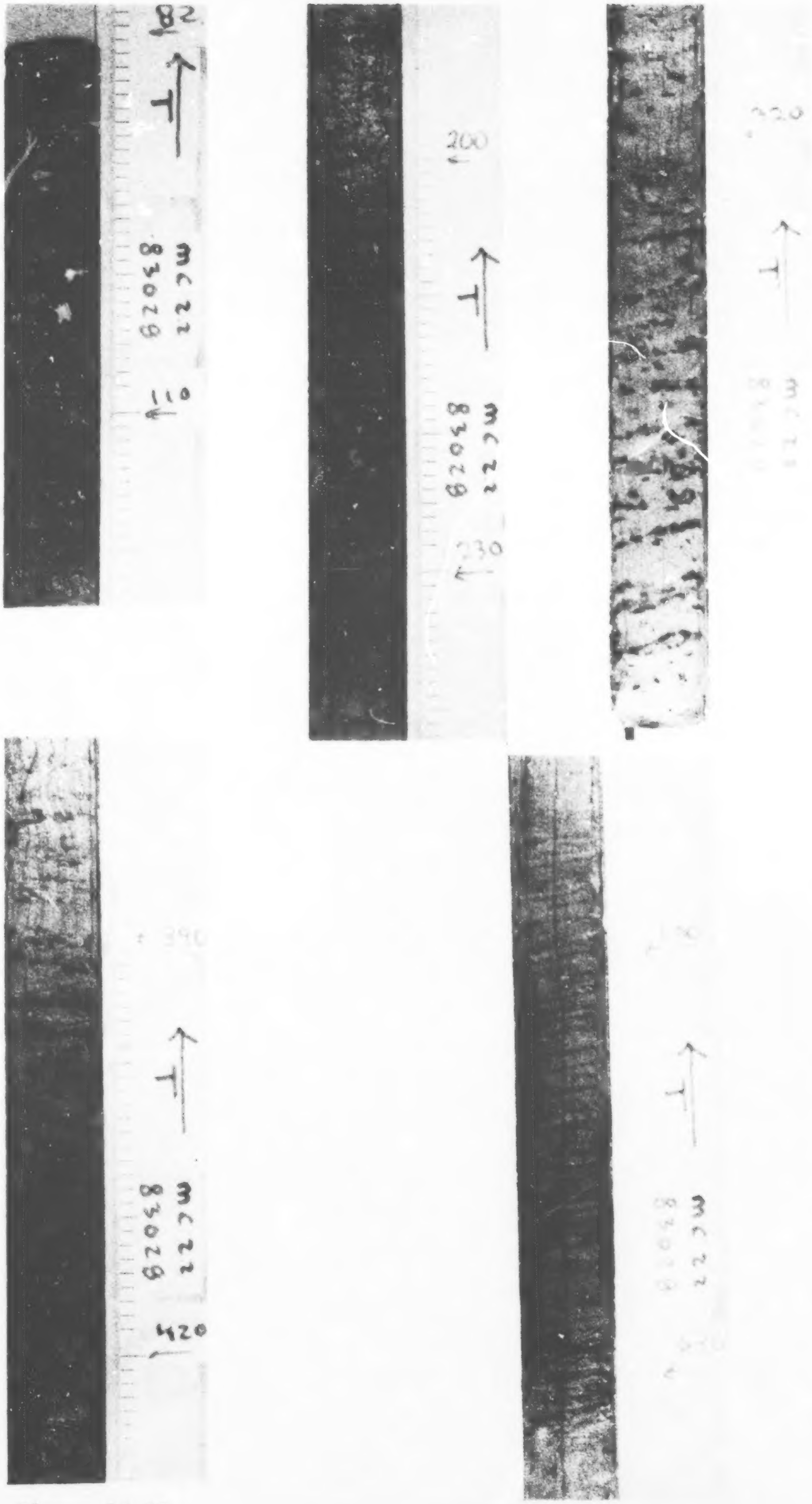


Figure 13.26

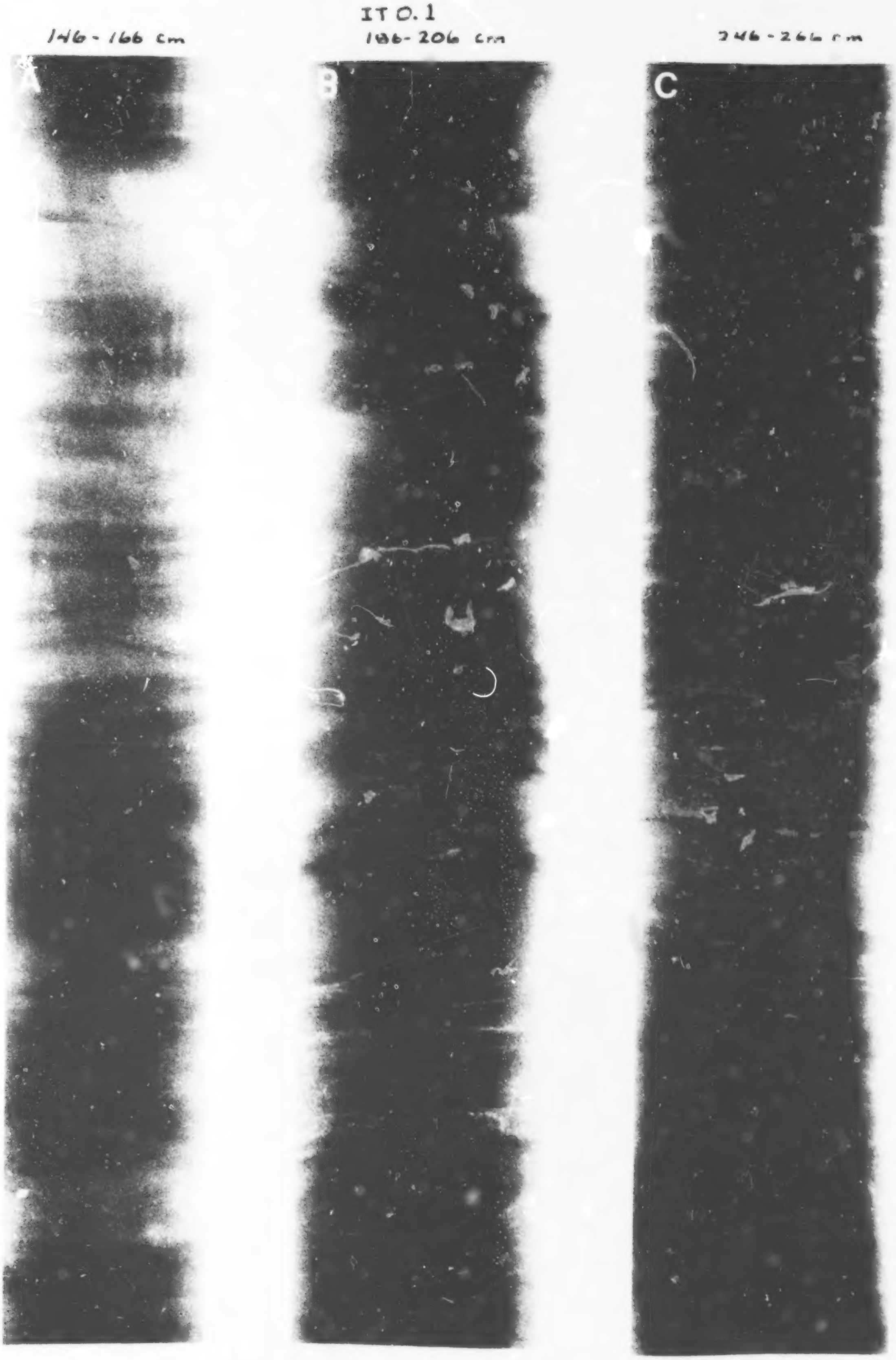
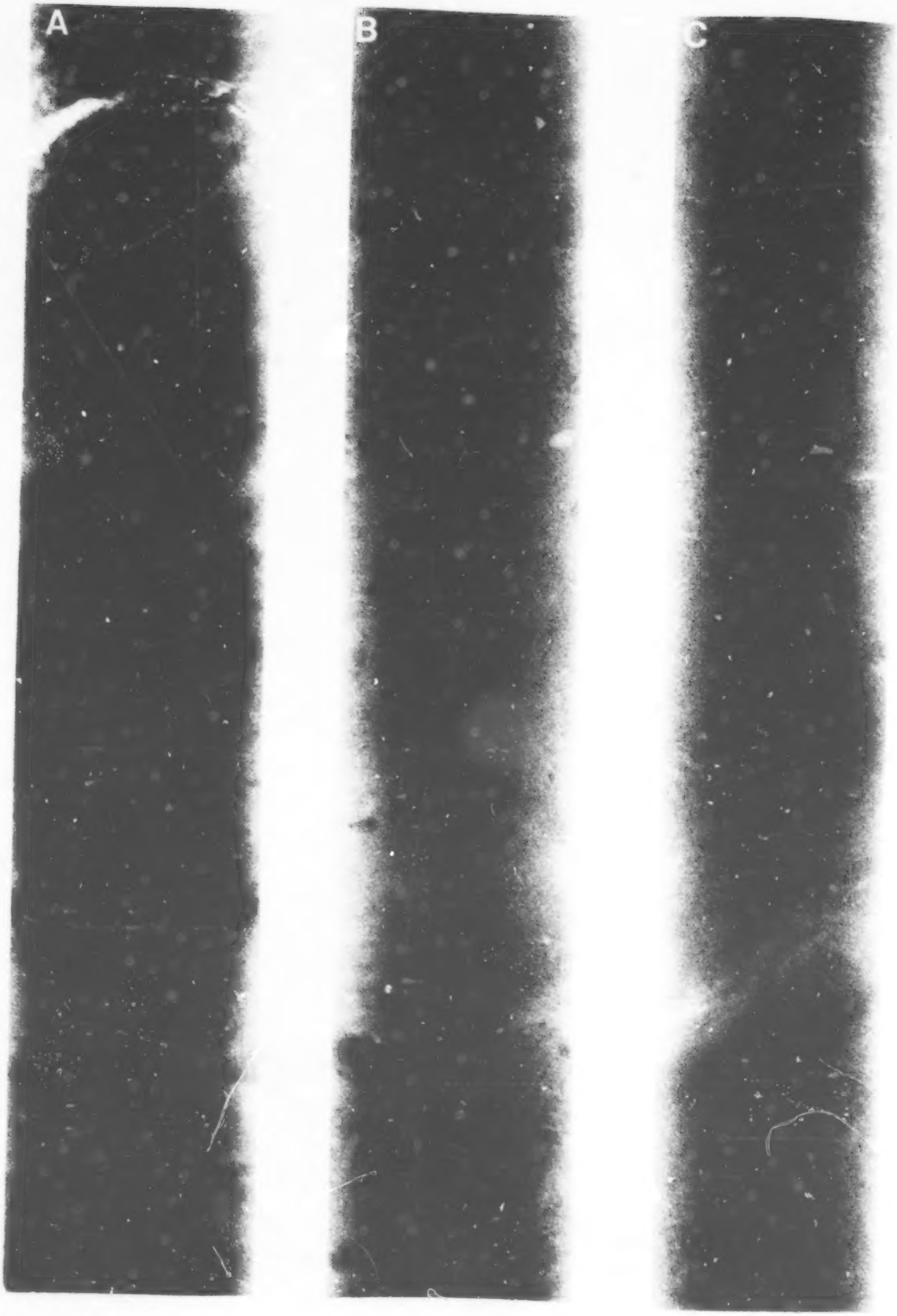


Figure 13.27

Figure 13.28

IT 0.4

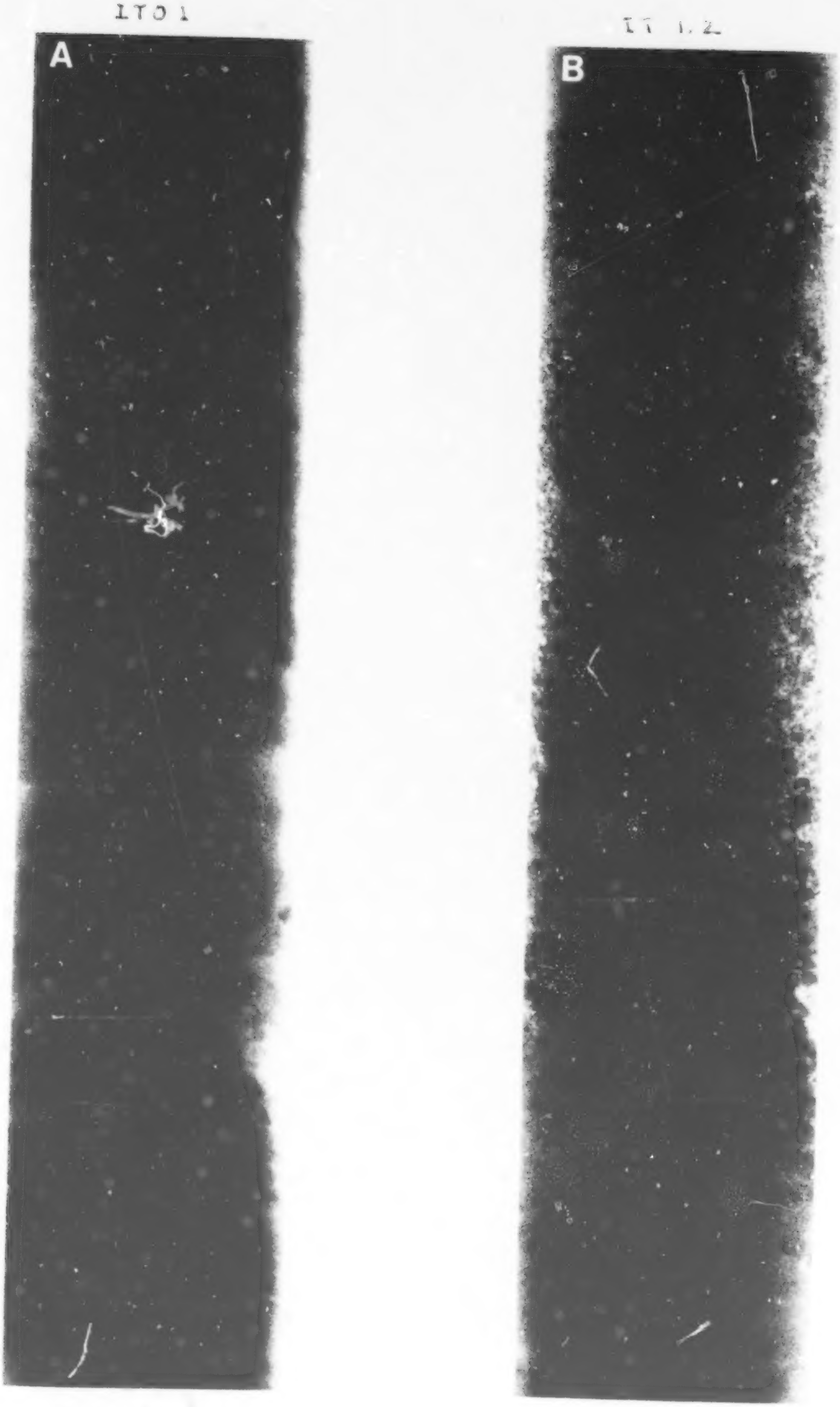


20-40 cm

40-60 cm

265-285 cm

Figure 13.29

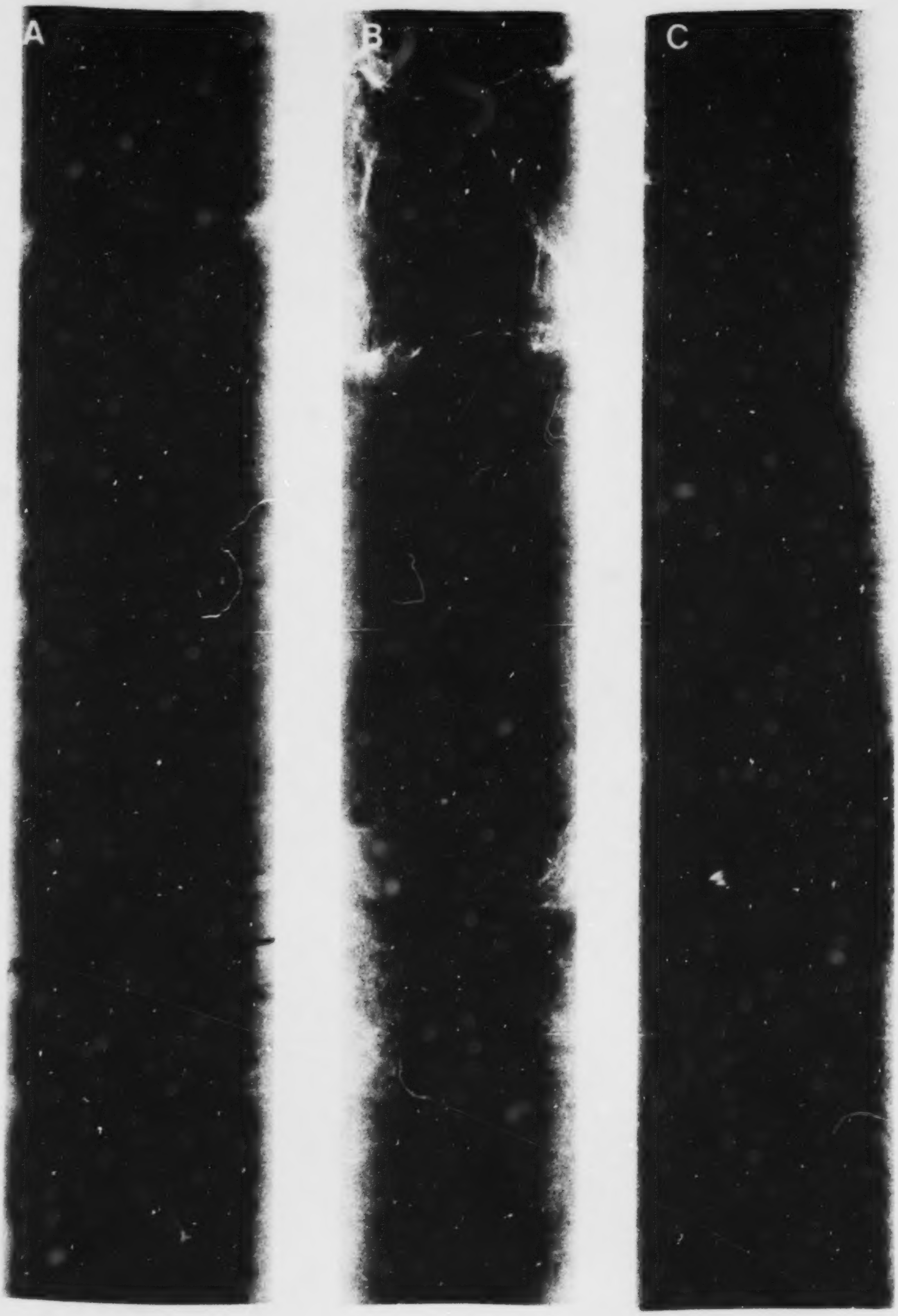


206-226 cm

120-140 cm

Figure 13.30

IT 1.2



180-200 cm

500-520 cm

580-600 cm

Figure 13.31

Figure 13.32

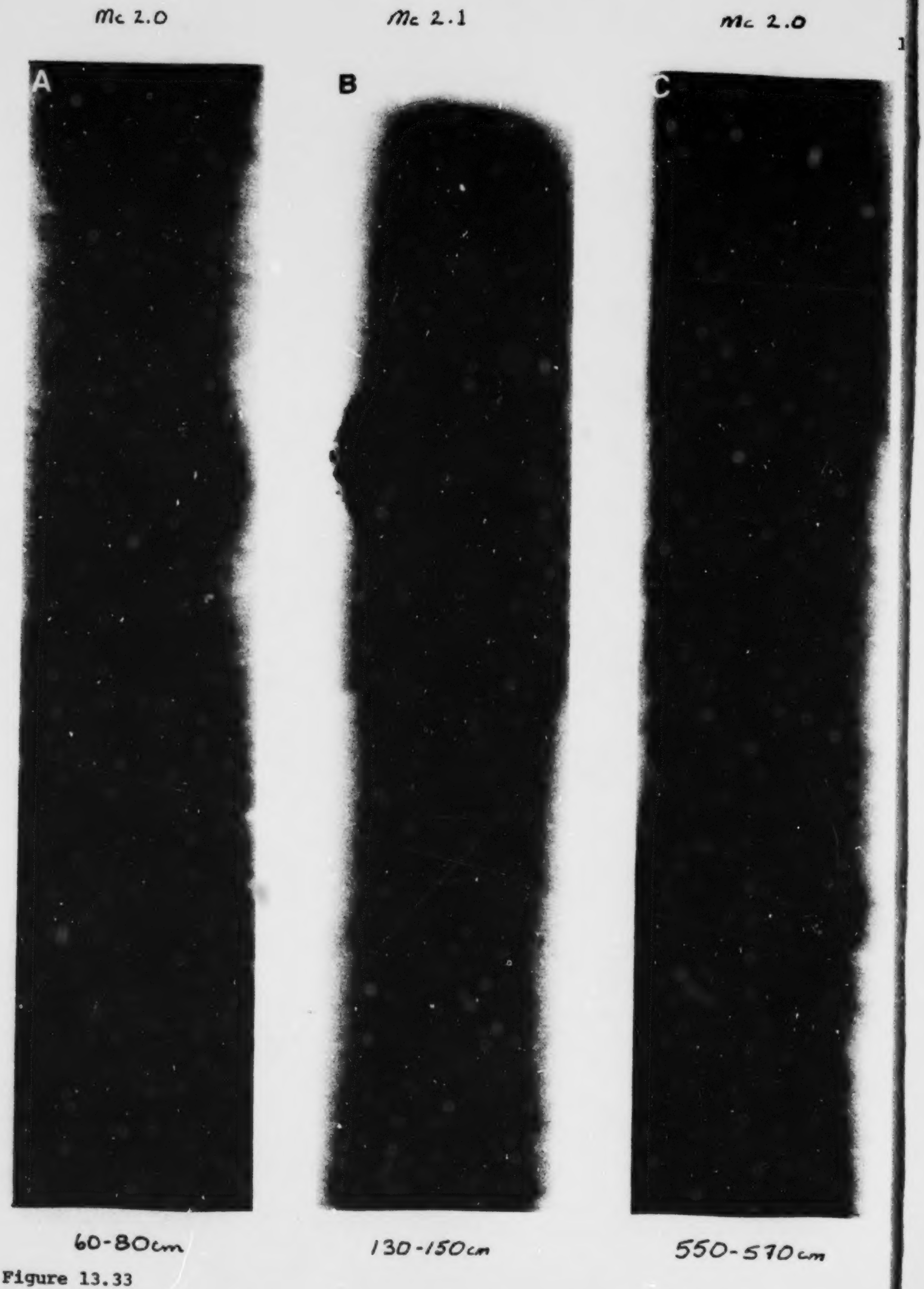
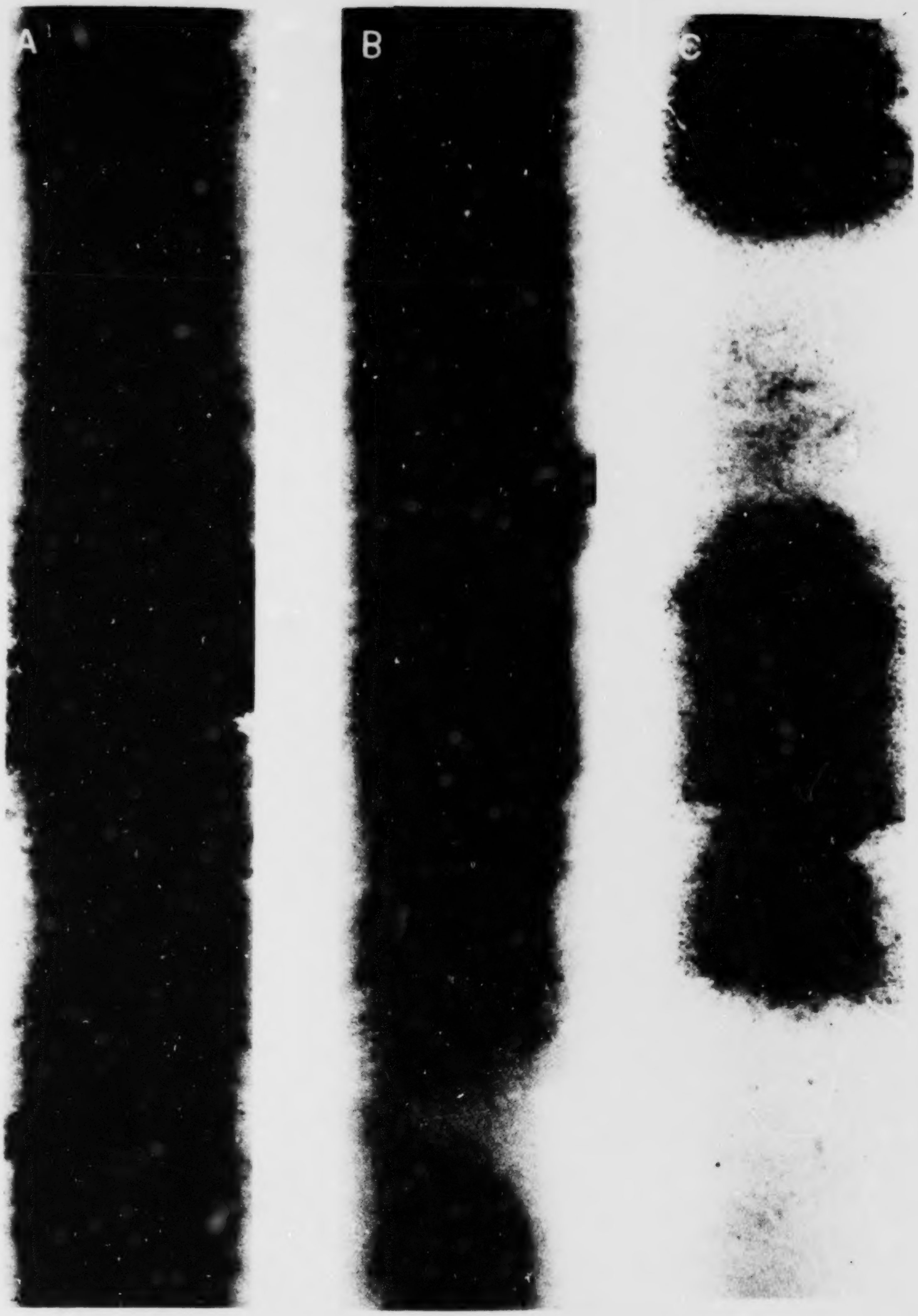


Figure 13.33

mC 2.2



60-80 cm

130-150 cm

550-570 cm

Figure 13.34

14-1

PRELIMINARY OBSERVATIONS ON CORES FROM CAMBRIDGE AND ITIRBILUNG FIORDS

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Queen's University, Kingston, Ontario K7L 3N6

INTRODUCTION

Five split cores, CA1.6, CA2.2, CA3.0, CA6 and IT2.1, from SAFE '83 are being studied at Queen's University (for location of the cores see Fig. 1). The first stage of the work involved x-raying and logging the cores. These results along with the results of the first grain size analysis of subsamples from the cores are reported here. Sandy layers were divided in half down the middle of the core. One side was sampled at 1 cm intervals and sieved at 0.25 0. The other side was impregnated with epoxy resin from which thin and polished sections will be made. The results of grain size are presented as Folk-Ward graphic measures.

CORE CA1.6

CA1.6 was recovered from 275 m of water, 5.5 km from the head of Cambridge Fiord. The bottom slopes directly down from the Keel River Delta at the head of the fiord. The core log is shown in Figure 2. The upper portion of the core is composed of fine sediments. Regular banding (although deformed during coring?) appears in x-radiographs between 10 and 22 cm depth (Fig. 3a). From there to 342 cm depth, the sediments are fine grained and massive, showing no structure in visible light or x-radiographs.

The lower section of the core is made up largely of massive, well sorted sands. The first layer from 342 - 364 cm is has a sharp upper boundary with the fine sediments above. Below, from 364 to 390 fine sediment and sands are intermixed, although the boundaries are sharply defined. In the lower sand layer which is 1.80 m thick, four zones can be recognised. The upper coarse sands extend from 390 to 450 cm. At 400 cm a single large particle of highly angular, fractured granodiorite 83 x 64 x 39 mm. There is no visible structure in the sands around the stone. Another zone of coarse sand occurs from 510 cm to 554 cm. Between these and at the bottom of the coarse layer are zones of finer sediments apparently containing more dark minerals. The lower section is shown in Figure 3b. At the bottom of this large layer of sands are two small bands of sand with a high content of dark minerals interspaced with layers of fine sediments (Fig. 4b). From this point to the bottom of the core is comprised of massive fine sediments.

CORE CA2.2

CA2.2 is from 290 m depth, 17.5 km downfiord from the inner sill in Cambridge Fiord. This sill at about 250 m depth probably isolates the region downfiord from sediments transported from the head of the fiord along the floor of the fiord. At this location the total thickness of sediment is estimated from the seismic data to be about 150 m.

The log of core CA2.2 is shown in Figure 4. The upper 1.40 m of the core consists of massive, fine grained sediment except for the region from 8.5 to 16.5 cm which appears well laminated in the x-radiograph (Fig. 8a). A similar zone in CA1.6 suggests deposition from overflowing water and absence of bioturbation during this period.

From 140 cm downward are alternating layers of sand and fine grained sediment. Grain size data at 1 cm intervals for the upper of these layers between 140 and 147 cm is shown in Figures 5 to 7 and summarized in Table 1. The sand moderately well to well sorted. Most samples are nearly symmetrical, although in a few there is a significant fine tail, perhaps related to the inclusion of small cohesive clasts of silt and clay (see below) which are not readily visible. There is no systematic pattern in any of the grain size parameters with depth in the sample, although the data in Figure 6 suggests that the coarse tails (represented by Ø5) become slightly finer near the top and the fine tail (Ø95) becomes slightly coarser near the bottom.

Two similar layers of coarse sediment occur below between 209 and 219 cm and 227 and 233 cm. Below the former is a clast of deformed laminated silt and sand which forms the boundary between the sand and fine sediments (Fig. 8b).

Below these layers is a series of 10 smaller layers of sand about 0.5 to 1.0 cm thick (Fig. 8c). These with numerous smaller sand partings are more or less equally spaced at about 2 to 3 cm intervals from 250 to 337 cm. One of the sand layers at 337 cm is deformed apparently into a roll-up structure.

A 1.18 m thick sand layer occurs in the bottom section of the core. A large clast of laminated finer sediment with a higher concentration of dark minerals occurs 10 cm below the top of this layer at 337 cm depth (Fig. 8d). Below this are smaller clasts of massive fine grained sediments from 358 to 370 cm depth. Grain size analysis of the bottom section of this layer shows a similar pattern to that of the smaller layer above (Fig. 9) except that the trends of that layer are not apparent. Samples around 428 cm and 442 cm have significantly finer fine tails perhaps from the occurrence of small clasts of fine sediment related to those shown above, but which are not visible.

The lowest sand layer extends from 480 to 520 cm. The grain size distribution in this layer is very similar to those above (Fig. 10). The sediment around 510 cm depth is distinctive having a larger standard deviation than the other samples, but a similar mean size.

From 520 to the bottom of the core is composed of fine grained sediments. A mollusc tentatively identifiied as Portlandia sp. occurs in this sediment at 525 cm.

CORES CA3.0 AND CA6

Both these cores occur in the vicinity of side entry glaciers in water depths of 365 and 665 m respectively. Both are composed of massive, fine grained sediment with small drop stones scattered throughout (Figs. 11 and 13). Several of the drop stones are relatively large (see Gilbert, Ch. 9, this volume). Delicate laminations appear throughout CA3.0 in the x-radiographs indicating the apparant absence of bioturbation (Fig. 12a). In CA3.0 between 480 and 500 cm depth are two clasts of well layered sand with a portion of each composed of sediment with a high content of dark minerals (Fig. 12b). The upper block has small clasts of fine grained sediment scattered throughout the light coloured sands. Both are apparently from the same block of sand and appear to have been placed in the fine sediment with little disturbance. They may have been dropped as frozen blocks of sand from ice on a beach or a sandur stream, and then melted as the fine sediments accumulated around them.

CORE IT2.1

IT2.1 from 325 m depth about mid fiord is composed nearly entirely of sand (Fig. 14), although x-radiography shows some differences in the texture of these sands. Most remarkable are bands of coarser grained material at intervals of about 8 cm. Two of these are shown in Figure 15b. Included within the sands throughout the core are elongate clasts of fine sediments (Fig. 15a). These along with the deformations visible in the surrounding sands may be the result of dewatering of the sand during or after deposition.

The grain size data are similar to those from the Cambridge cores (Figs. 16 and 17), except that the fine-tail skewness is more evident, perhaps related to the inclusion of the clay clasts described above.

ONGOING RESEARCH

The results persented here are only the preliminary descriptions of the sedimentary characteristics of these cores. Work to follow in our laboratories will include:

- completion of the analysis of the texture of the coarse and fine sediments,
- analysis of other characteristics of the sediments including water content and heavy minerals,
- impregnation of the coarse sediments from which polished and thin sections will be prepared to assess fabric, packing, porosity and composition,

From these observations interpretation of the sedimentary processes will be made.

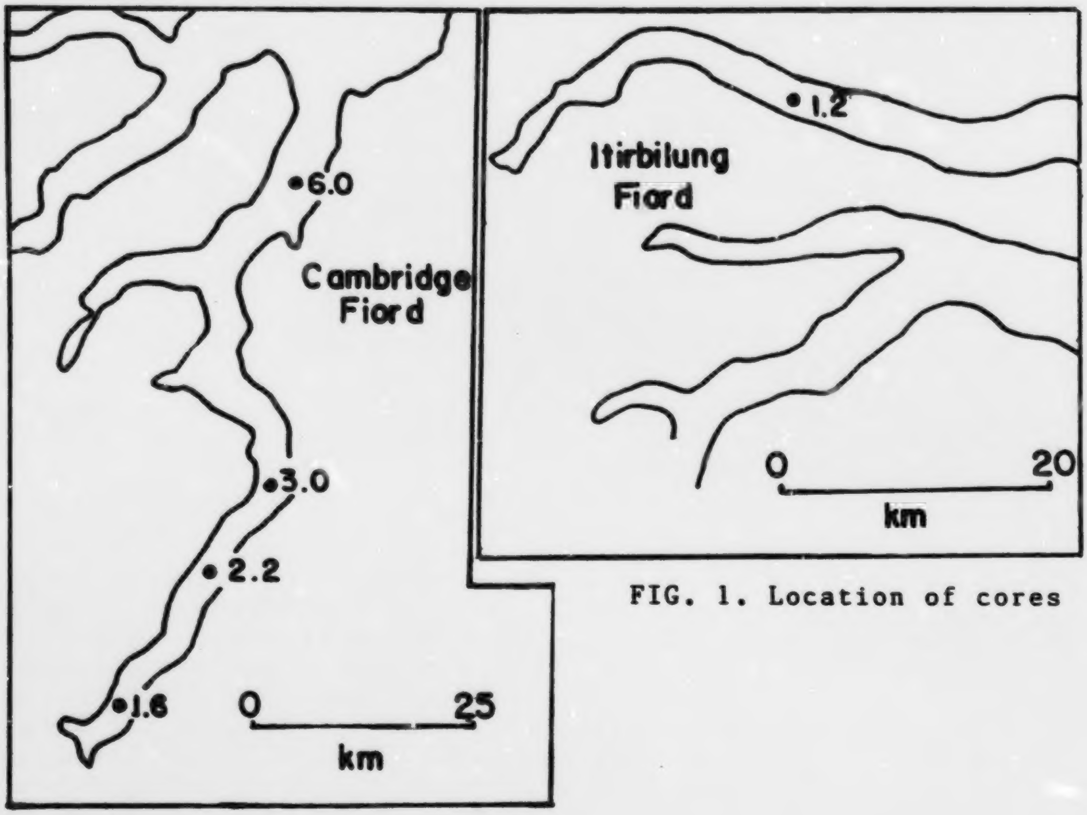


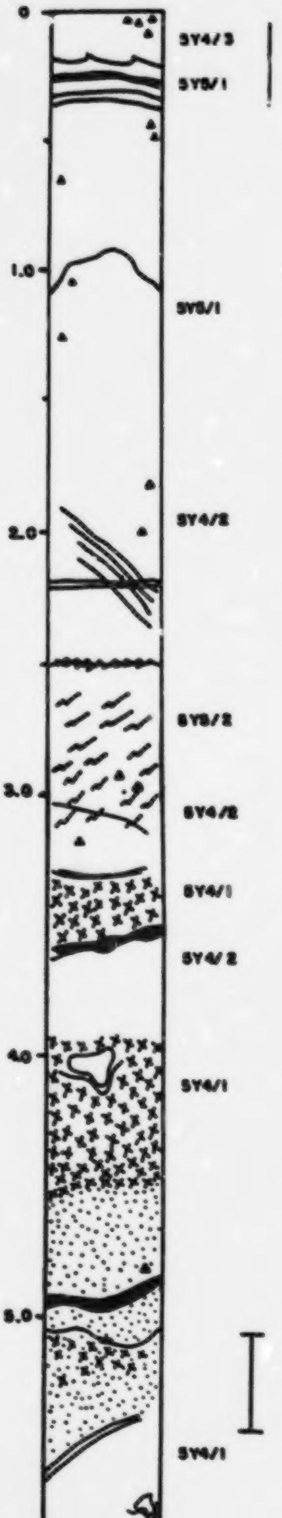
FIG. 1. Location of cores

TABLE 1: SUMMARY STATISTICS - GRAIN SIZE OF SANDS IN CORES

Core	Depth cm	Phi							Mean	St. dev.	Skew	Kurtosis
		5	16	25	50	75	84	95				
CA2.2	140	0.8	1.2	1.4	1.7	2.1	2.3	3.2	1.73	0.64	0.170	1.41
	141	0.8	1.1	1.3	1.6	2.0	2.2	2.8	1.63	0.58	0.145	1.17
	142	0.9	1.1	1.3	1.6	2.1	2.6	3.3	1.77	0.74	0.375	1.23
	143	0.6	0.9	1.1	1.4	1.8	2.1	2.9	1.47	0.65	0.236	1.35
	144	0.3	0.7	1.1	1.5	1.8	2.2	2.8	1.47	0.75	-0.013	1.46
	145	0.5	0.9	1.2	1.5	2.0	2.5	3.2	1.63	0.81	0.255	1.38
	146	0.3	0.9	1.3	1.5	2.0	2.1	3.3	1.50	0.75	0.100	1.76
	147	0.3	0.8	1.2	1.7	2.2	2.5	3.7	1.67	0.94	0.059	1.39
	416	0.6	1.1	1.3	1.7	2.2	2.5	3.4	1.77	0.77	0.179	1.28
	418	0.6	1.2	1.3	1.8	2.2	2.4	3.1	1.80	0.68	0.020	1.14
	420	0.8	1.1	1.4	1.8	2.0	2.2	3.4	1.70	0.67	-0.021	1.78
	422	0.9	1.3	1.5	1.8	2.0	2.3	3.1	1.80	0.58	0.091	1.80
	424	0.6	1.1	1.3	1.6	2.0	2.4	3.1	1.70	0.70	0.215	1.46
	426	0.7	1.1	1.3	1.5	2.1	2.4	3.1	1.67	0.69	0.359	1.23
	427	0.6	1.1	1.3	1.6	2.1	2.4	3.1	1.70	0.70	0.215	1.28
	428	0.7	1.2	1.3	1.7	2.2	2.6	4.6	1.83	0.94	0.386	1.78
	429	0.7	1.1	1.3	1.6	2.1	2.4	3.0	1.70	0.67	0.224	1.18
	430	0.7	1.1	1.3	1.5	2.2	2.5	3.0	1.70	0.70	0.366	1.05
	432	0.5	1.1	1.3	1.5	2.1	2.3	3.0	1.63	0.68	0.267	1.28
	434	0.6	0.9	1.1	1.5	2.1	2.4	3.0	1.60	0.74	0.225	0.98
	436	0.5	0.9	1.1	1.5	2.2	2.3	3.0	1.57	0.73	0.171	0.93
	438	0.5	0.9	1.1	1.5	2.0	2.2	2.8	1.53	0.67	0.104	1.05
	440	0.6	0.8	1.1	1.5	1.9	2.2	2.7	1.50	0.67	0.071	1.08
	441	0.5	0.7	1.1	1.5	1.9	2.1	2.9	1.43	0.71	0.012	1.23
	442	0.6	0.9	1.1	1.3	2.1	2.3	4.1	1.50	0.88	0.514	1.43
	443	0.5	0.9	1.1	1.5	1.9	2.1	2.9	1.50	0.66	0.083	1.23
	444	0.4	0.6	1.1	1.4	2.1	2.3	2.7	1.43	0.77	0.095	0.94
	446	0.5	0.7	1.1	1.3	2.1	2.2	2.7	1.40	0.71	0.236	0.90
	448	0.4	0.8	1.0	1.3	2.1	2.3	3.0	1.47	0.77	0.321	0.97
	450	0.4	0.6	1.0	1.5	2.1	2.3	2.7	1.47	0.77	-0.008	0.86
	452	0.5	0.7	0.9	1.3	1.9	2.2	2.7	1.40	0.71	0.236	0.90
	454	0.4	0.7	0.9	1.3	1.9	2.3	2.9	1.43	0.78	0.265	1.02
	482	1.3	1.7	2.0	2.4	3.3	3.5	4.2	2.53	0.89	0.232	0.91
	484	1.5	1.9	2.2	2.5	3.1	3.5	4.4	2.63	0.84	0.280	1.32
	486	1.6	2.1	2.4	2.6	3.1	3.3	4.3	2.67	0.71	0.213	1.58
	488	1.6	2.1	2.4	2.6	3.1	3.4	4.1	2.70	0.70	0.215	1.46
	490	1.6	2.0	2.2	2.6	3.1	3.4	4.2	2.67	0.74	0.187	1.18
	492	1.5	1.9	2.1	2.6	3.0	3.2	4.2	2.57	0.73	0.054	1.23
	494	1.4	1.9	2.1	2.3	2.7	3.1	3.8	2.43	0.66	0.292	1.64
	496	1.5	1.9	2.1	2.5	2.8	3.1	4.1	2.50	0.69	0.115	1.52
	498	1.4	1.9	2.2	2.4	2.7	3.1	4.1	2.47	0.71	0.213	2.21
	500	1.5	1.9	2.1	2.5	2.7	3.1	4.2	2.50	0.71	0.130	1.84

	502	1.5	1.9	2.2	2.5	2.9	3.2	4.2	2.53	0.73	0.168	1.58
	504	1.5	1.9	2.1	2.4	2.7	3.0	4.1	2.43	0.67	0.199	1.78
	506	1.5	1.8	2.1	2.5	2.8	3.1	4.1	2.47	0.72	0.077	1.52
	508	1.4	1.9	2.1	2.4	2.8	3.3	4.2	2.53	0.77	0.286	1.64
	509	0.3	1.6	2.0	2.5	3.1	3.6	4.4	2.57	1.12	0.013	1.53
	510	0.4	1.3	1.8	2.6	3.5	4.3	5.0	2.73	1.45	0.088	1.11
	511	0.3	1.0	1.8	2.5	3.6	4.2	4.6	2.57	1.45	0.020	0.98
	512	1.5	1.8	2.0	2.3	2.9	3.1	4.2	2.40	0.73	0.319	1.23
	514	1.3	1.6	1.8	2.2	2.7	3.1	4.1	2.30	0.80	0.279	1.28
	516	1.4	1.6	1.8	2.2	2.6	2.8	4.1	2.20	0.71	0.204	1.38
	518	1.3	1.7	1.8	2.1	2.6	2.8	4.2	2.20	0.71	0.361	1.49
	520	1.4	1.7	1.9	2.2	2.8	3.1	4.2	2.33	0.77	0.357	1.28
IT2.1	6	1.0	1.2	1.5	1.8	2.3	2.6	3.0	1.87	0.65	0.171	1.02
	8	0.9	1.2	1.4	1.8	2.2	2.4	2.8	1.80	0.59	0.026	0.97
	10	0.8	1.2	1.4	1.9	2.1	2.5	3.0	1.87	0.66	-0.038	1.29
	12	0.9	1.2	1.3	1.8	2.3	2.5	3.0	1.83	0.64	0.110	0.86
	14	0.8	1.1	1.3	1.8	2.2	2.3	3.0	1.73	0.63	-0.038	1.00
	16	0.8	1.2	1.4	1.8	2.2	2.5	2.9	1.83	0.64	0.062	1.08
	18	0.8	1.2	1.3	1.8	2.1	2.5	2.9	1.83	0.64	0.062	1.08
	20	0.8	1.1	1.3	1.7	2.2	2.5	3.0	1.77	0.68	0.162	1.00
	22	0.8	1.1	1.3	1.7	2.1	2.5	2.9	1.77	0.67	0.143	1.08
	24	0.7	1.2	1.3	2.0	2.2	2.5	3.0	1.90	0.67	-0.181	1.05
	26	0.7	1.1	1.3	1.6	2.1	2.4	3.0	1.70	0.67	0.224	1.18
	28	0.5	1.1	1.3	1.5	2.0	2.4	3.0	1.67	0.70	0.292	1.46
	30	0.5	1.0	1.2	1.5	2.1	2.4	2.9	1.63	0.71	0.226	1.09
	32	0.7	1.0	1.2	1.5	2.1	2.4	2.9	1.63	0.68	0.279	1.00
	34	0.6	1.0	1.2	1.5	2.1	2.4	2.9	1.63	0.70	0.252	1.05
	36	0.4	0.8	1.1	1.5	2.1	2.4	2.9	1.57	0.78	0.123	1.02
	38	0.5	1.0	1.2	1.5	2.1	2.4	3.0	1.63	0.73	0.243	1.14
	40	0.6	1.0	1.1	1.5	2.1	2.4	3.1	1.63	0.73	0.283	1.02
	42	0.3	0.7	0.9	1.3	1.8	2.1	2.9	1.37	0.74	0.187	1.18
	44	0.6	1.0	1.3	1.6	2.1	2.4	3.0	1.67	0.71	0.155	1.23
	46	0.4	0.7	1.0	1.4	2.0	2.3	2.9	1.47	0.78	0.163	1.02
	48	0.4	0.8	0.9	1.5	2.0	2.3	2.9	1.53	0.75	0.093	0.93
	50	0.6	0.9	1.1	1.5	2.3	2.9	3.3	1.77	0.91	0.367	0.92
	52	0.5	0.8	1.1	1.5	2.1	2.3	3.0	1.53	0.75	0.133	1.02
	54	0.5	0.8	1.1	1.5	2.0	2.4	2.9	1.57	0.76	0.146	1.09
	56	0.3	0.6	0.9	1.2	1.7	2.0	2.5	1.27	0.68	0.162	1.13
	58	0.4	0.7	1.1	1.7	2.2	2.4	2.9	1.60	0.80	-0.108	0.93
	60	0.5	0.8	1.1	1.5	2.1	2.4	3.0	1.57	0.78	0.163	1.02
	62	0.4	0.7	0.9	1.3	1.7	2.0	2.7	1.33	0.67	0.147	1.18
	64	0.2	0.6	0.8	1.1	1.7	2.1	2.8	1.27	0.77	0.321	1.18
	66	0.4	0.7	1.1	1.5	2.1	2.4	2.9	1.53	0.80	0.089	1.02
	68	0.4	0.7	1.0	1.4	1.9	2.3	2.9	1.47	0.78	0.163	1.14
	70	0.4	0.6	0.8	1.3	1.7	2.1	3.0	1.33	0.77	0.187	1.18
	72	0.3	0.6	0.9	1.3	2.1	2.5	3.1	1.47	0.90	0.274	0.96
	74	0.4	0.6	0.9	1.4	2.1	2.4	3.0	1.47	0.84	0.171	0.89
	76	0.3	0.6	0.8	1.4	1.9	2.4	2.9	1.47	0.84	0.132	0.97

78	0.2	0.5	0.7	1.1	1.8	2.1	2.6	1.23	0.76	0.250	0.89
80	0.4	0.7	0.9	1.3	2.1	2.4	3.0	1.47	0.82	0.301	0.89
82	0.4	0.6	0.9	1.4	2.0	2.3	2.9	1.43	0.80	0.129	0.93
84	0.3	0.5	0.6	1.1	1.8	2.3	3.0	1.30	0.86	0.370	0.92
86	0.2	0.7	0.9	1.5	2.1	2.4	3.0	1.53	0.85	0.065	0.96
88	0.4	0.6	0.9	1.5	2.1	2.3	3.0	1.47	0.82	0.048	0.89
90	0.2	0.4	0.7	1.1	1.8	2.1	2.9	1.20	0.83	0.255	1.01
92	0.3	0.6	0.9	1.3	2.0	2.4	2.9	1.43	0.84	0.226	0.97
94	0.3	0.6	0.9	1.4	2.1	2.3	2.9	1.43	0.82	0.106	0.89
96	0.2	0.6	0.9	1.3	1.9	2.1	3.0	1.33	0.80	0.140	1.15
98	0.2	0.5	0.9	1.5	2.1	2.5	3.0	1.50	0.92	0.036	0.96
100	0.1	0.6	0.8	1.3	2.0	2.4	2.9	1.43	0.87	0.183	0.96
102	0.4	0.6	0.9	1.5	2.1	2.4	2.9	1.50	0.83	0.060	0.85
104	0.2	0.4	0.7	1.1	1.8	2.1	2.9	1.20	0.83	0.255	1.01
106	0.2	0.6	0.9	1.5	2.2	2.5	2.9	1.53	0.88	0.045	0.85
108	0.2	0.6	0.9	1.3	2.1	2.4	2.9	1.43	0.86	0.204	0.92
110	0.2	0.6	0.9	1.3	2.1	2.3	2.9	1.40	0.83	0.181	0.92



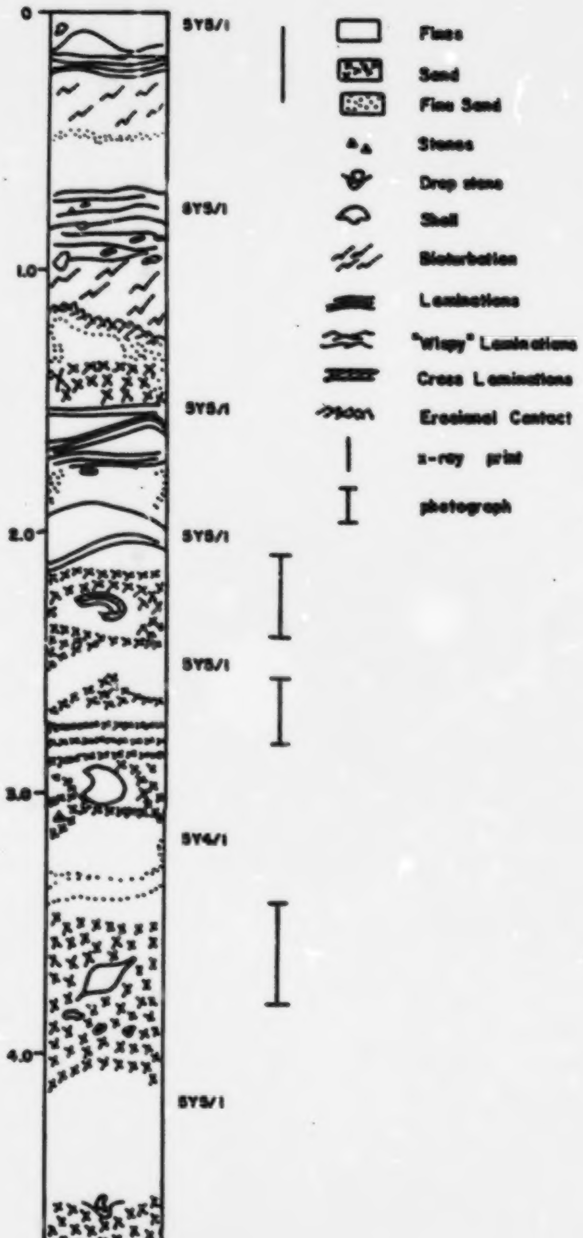
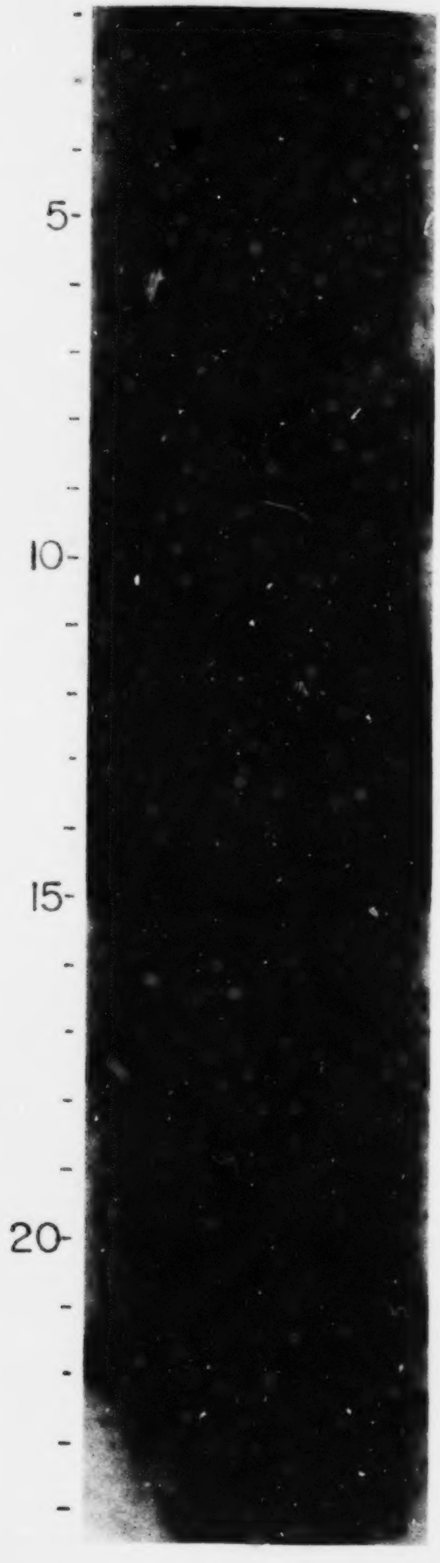


FIG. 2 (left). Log of Core CA1.6

FIG. 4 (right). Log of Core CA2.2



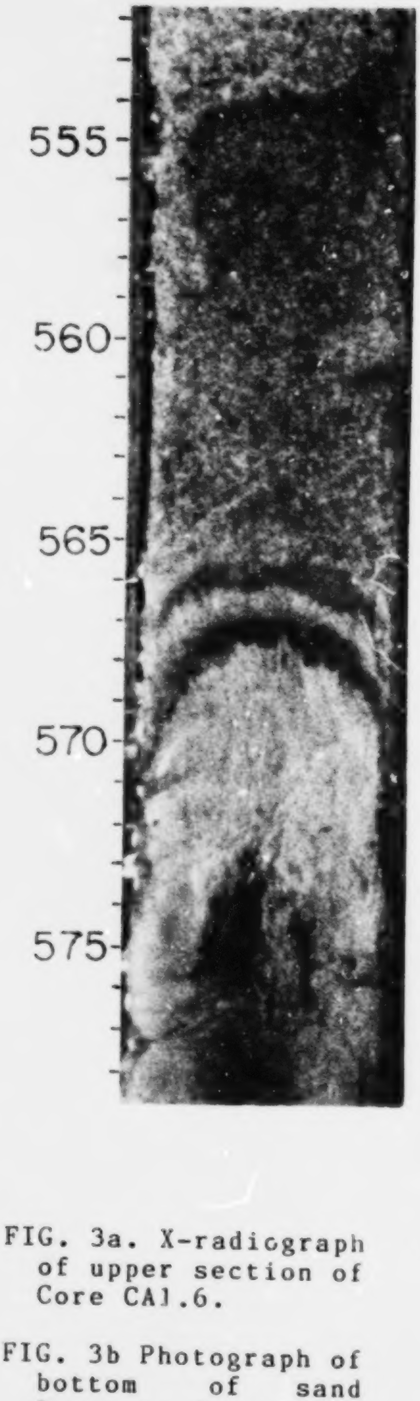


FIG. 3a. X-radiograph of upper section of Core CA1.6.

FIG. 3b Photograph of bottom of sand layer in Core CA1.6

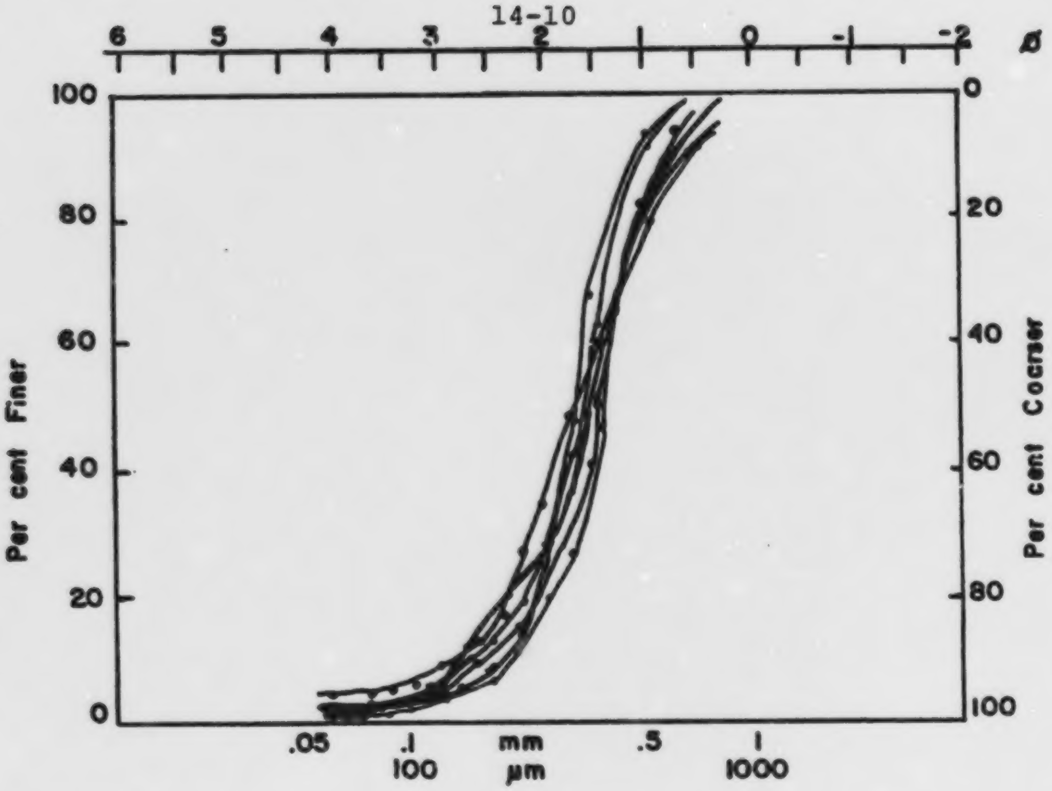


FIG. 5. Grain size distributions of the sand lens from 140 to 147 cm in Core CA2.2.

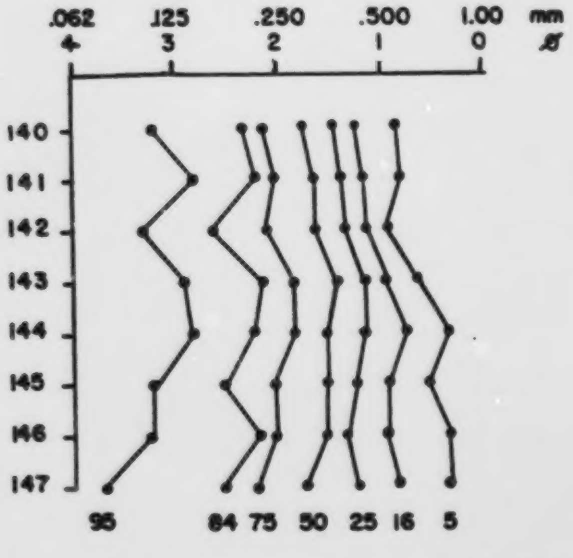


FIG. 6. Per cent coarser in samples at 1 cm intervals from the upper sand lens from 140 to 147 cm in Core CA2.2.

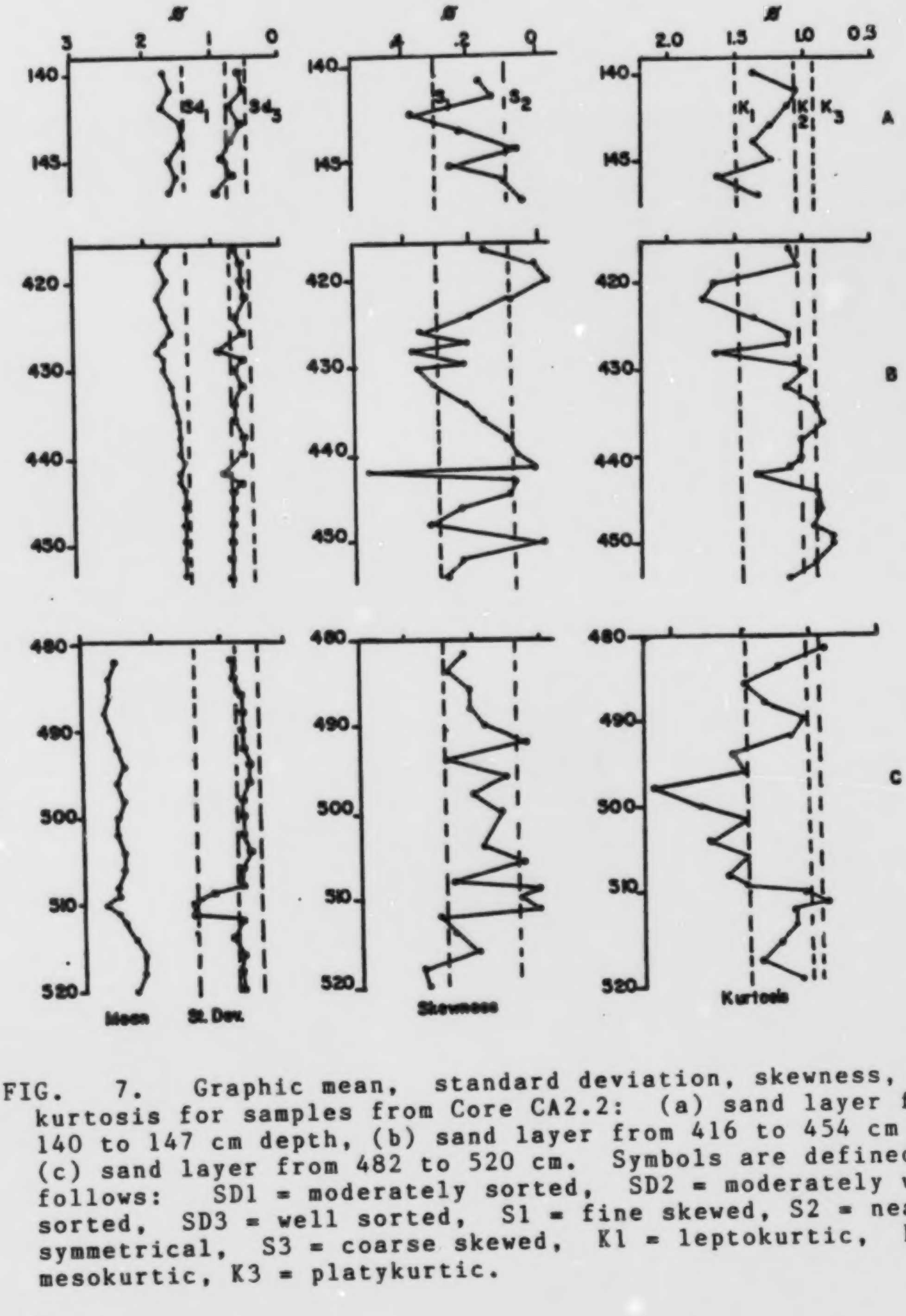
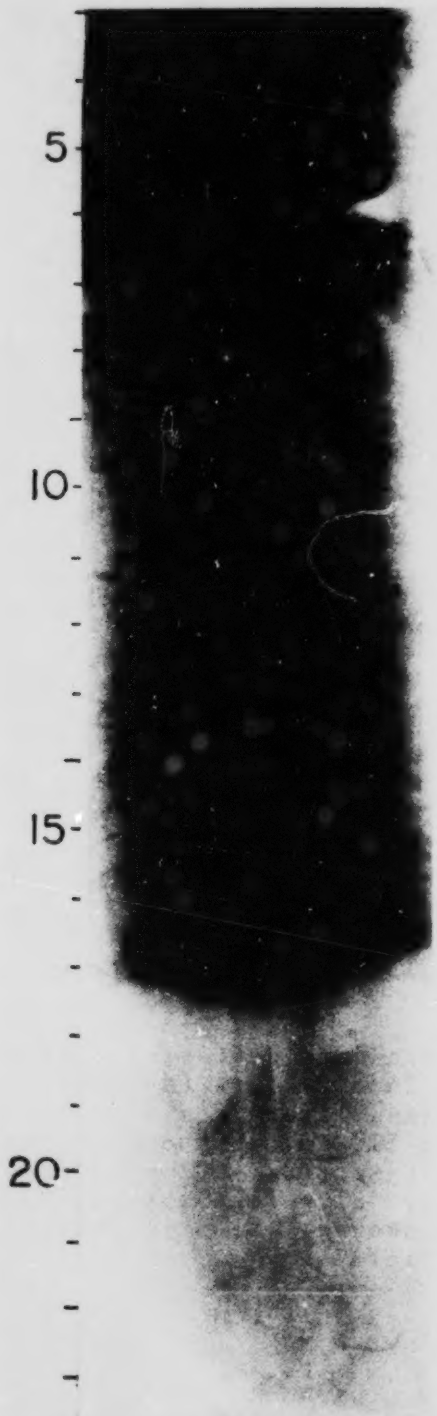


FIG. 7. Graphic mean, standard deviation, skewness, and kurtosis for samples from Core CA2.2: (a) sand layer from 140 to 147 cm depth, (b) sand layer from 416 to 454 cm and (c) sand layer from 482 to 520 cm. Symbols are defined as follows: SD1 = moderately sorted, SD2 = moderately well sorted, SD3 = well sorted, S1 = fine skewed, S2 = nearly symmetrical, S3 = coarse skewed, K1 = leptokurtic, K2 = mesokurtic, K3 = platykurtic.



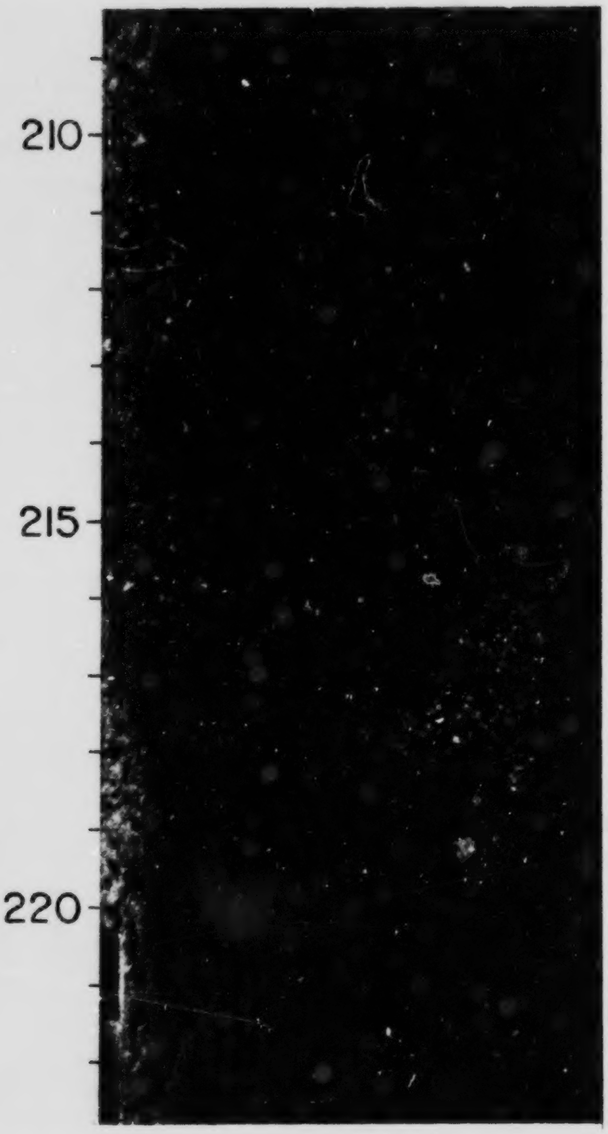
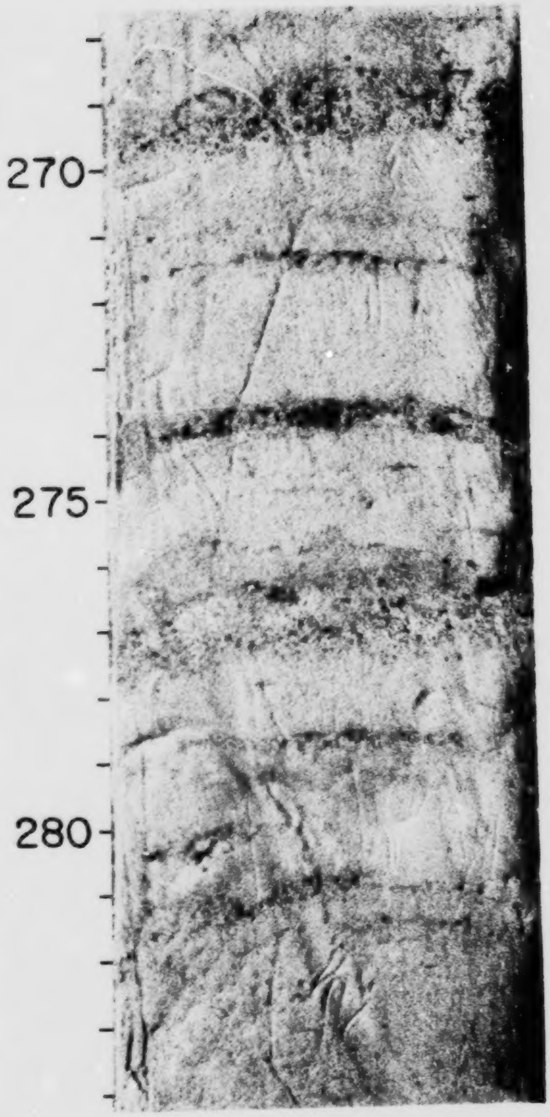


FIG. 8a. X-radiograph of the upper portion of core CA2.2.
FIG. 8b. Photograph of sand layer from 209 to 219 cm in Core CA2.2.



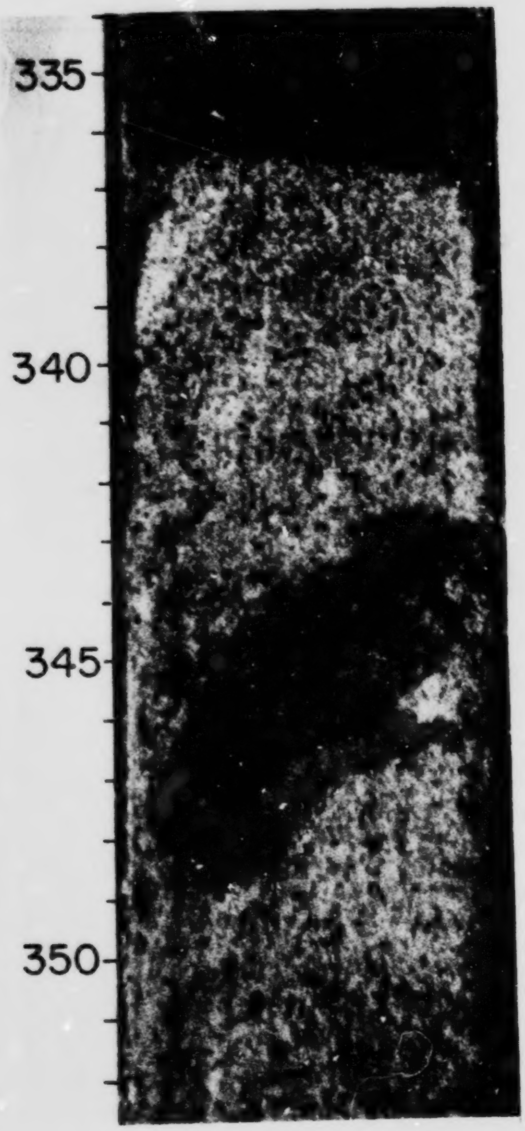


FIG. 8c. Photograph of small sand layers from 268 to 284 cm in Core CA2.2

FIG. 8d. Photograph of clast of laminated fine sediment m near the top of sand layer in Core CA2.2.

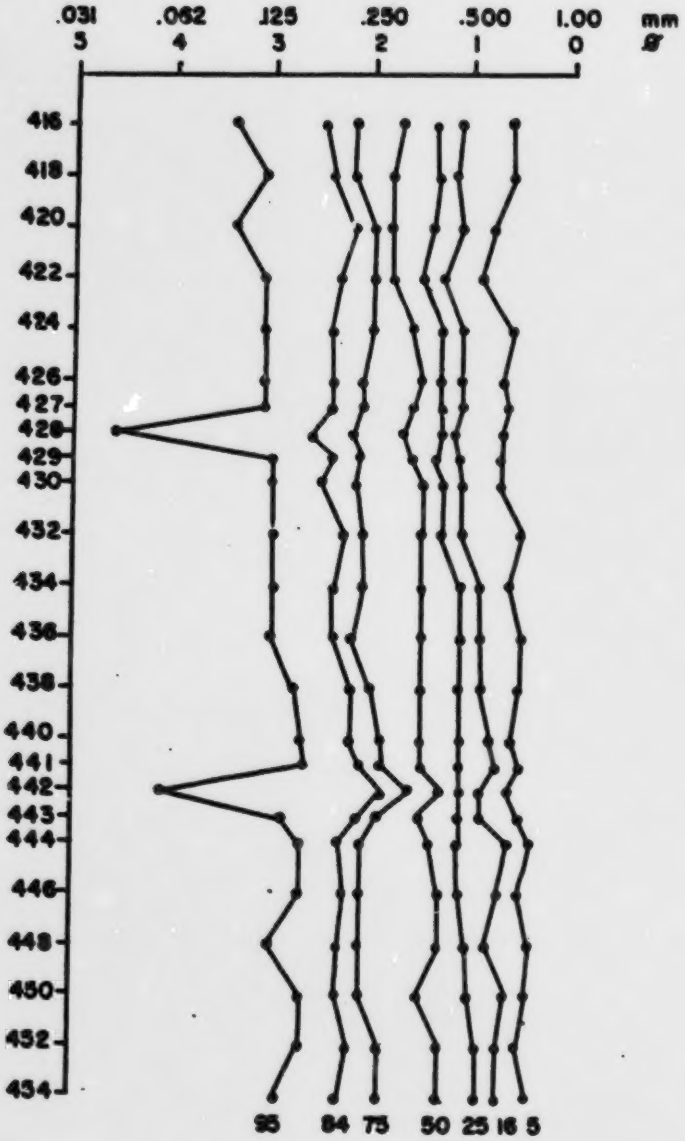


FIG. 9. Per cent coarser in samples at 2 cm intervals from sand lens from 416 to 454 cm in Core CA2.2.

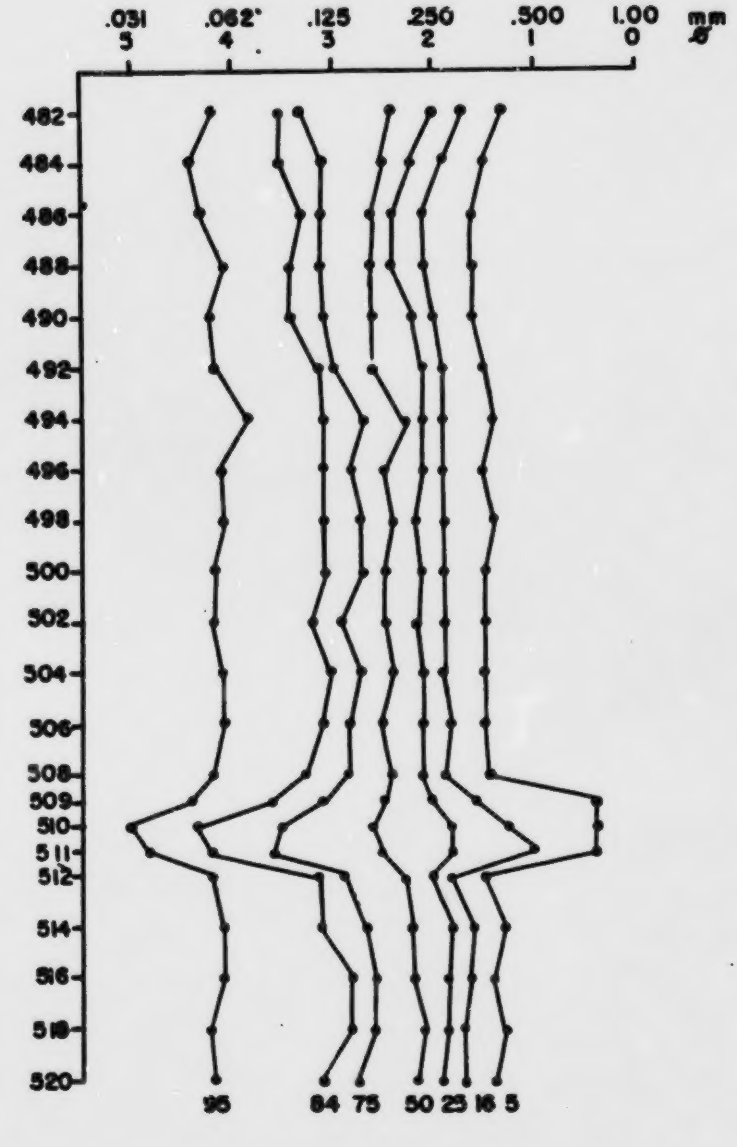


FIG. 10. Per cent coarser in samples at 2 cm intervals from sand lens from 482 to 520 cm in Core CA2.2.

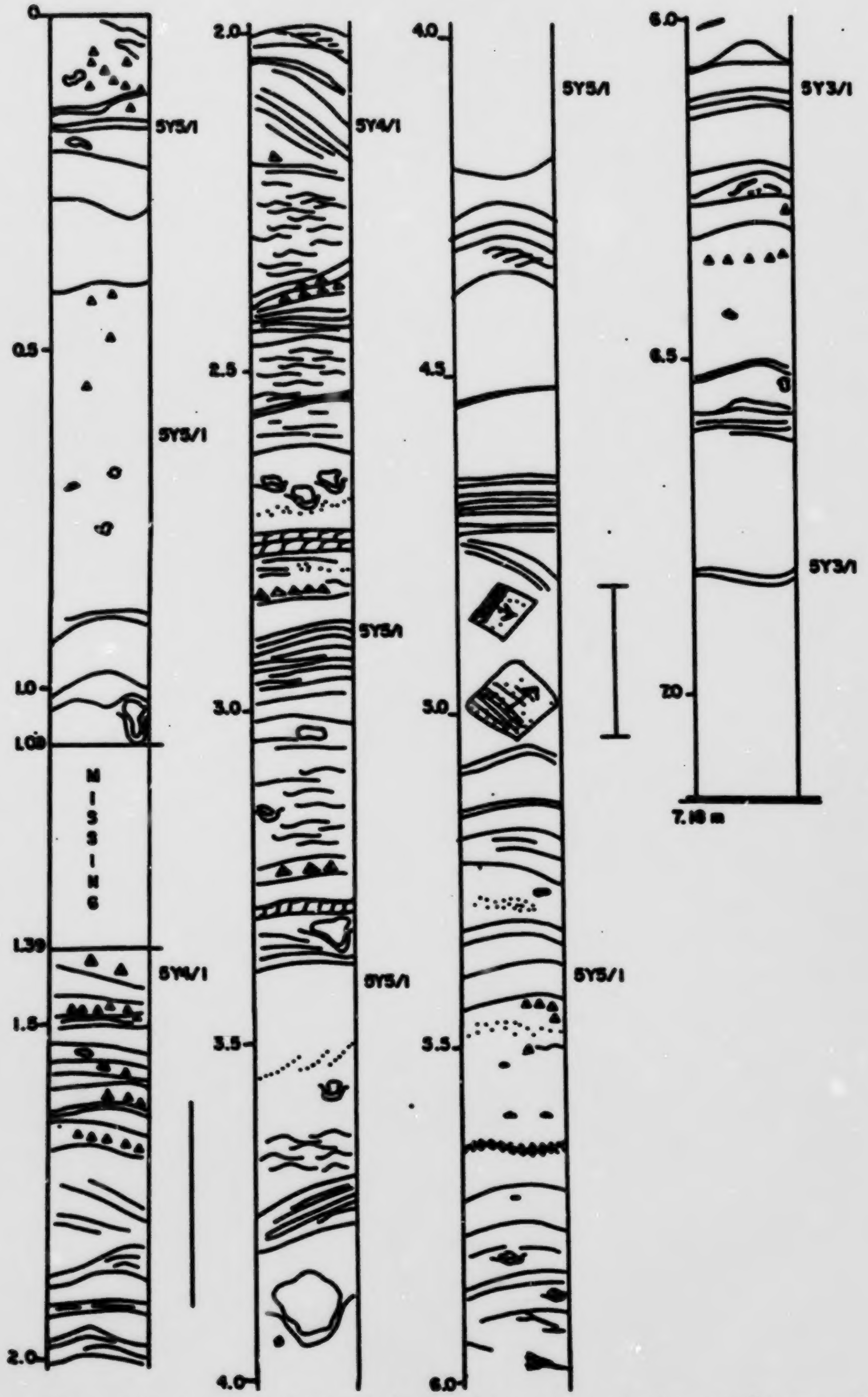
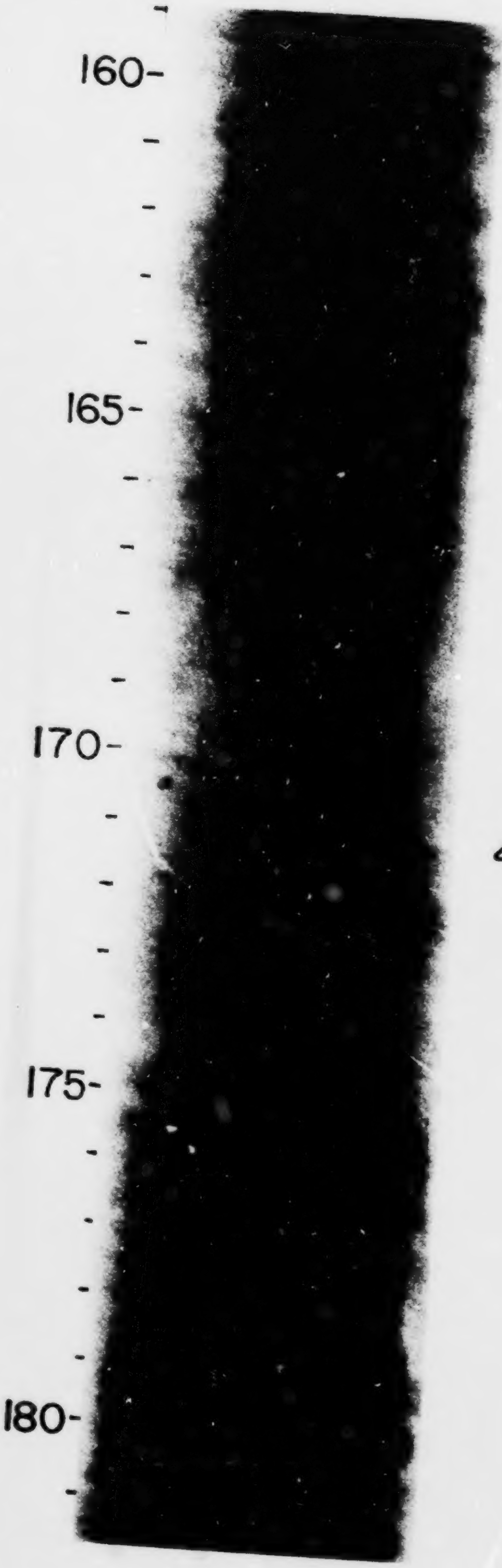


FIG. 11. Log of Core CA3.0 Key to symbols in Figure 4.



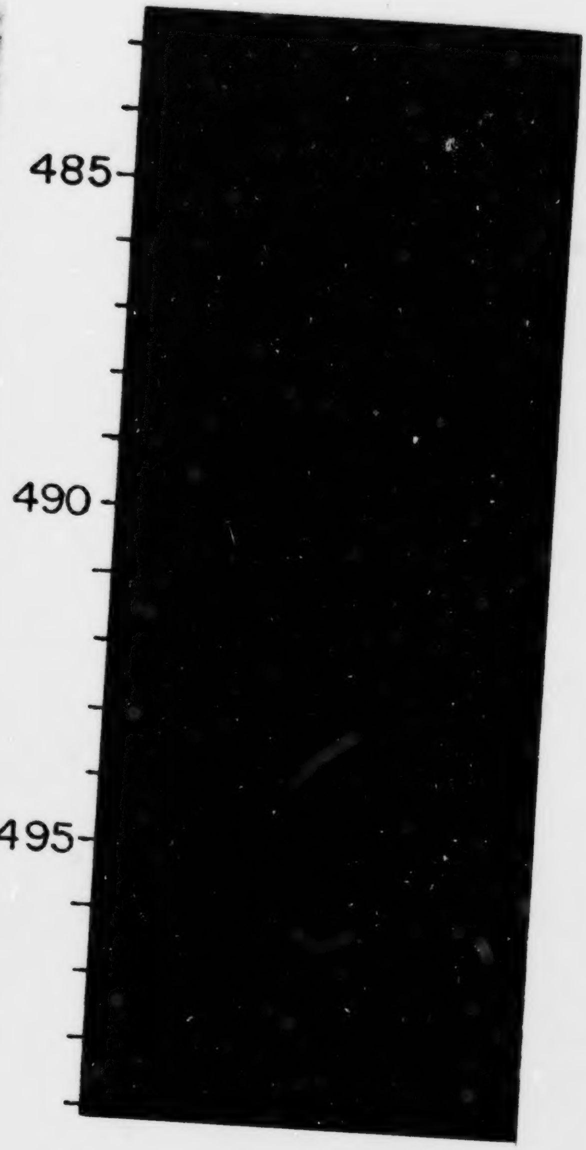
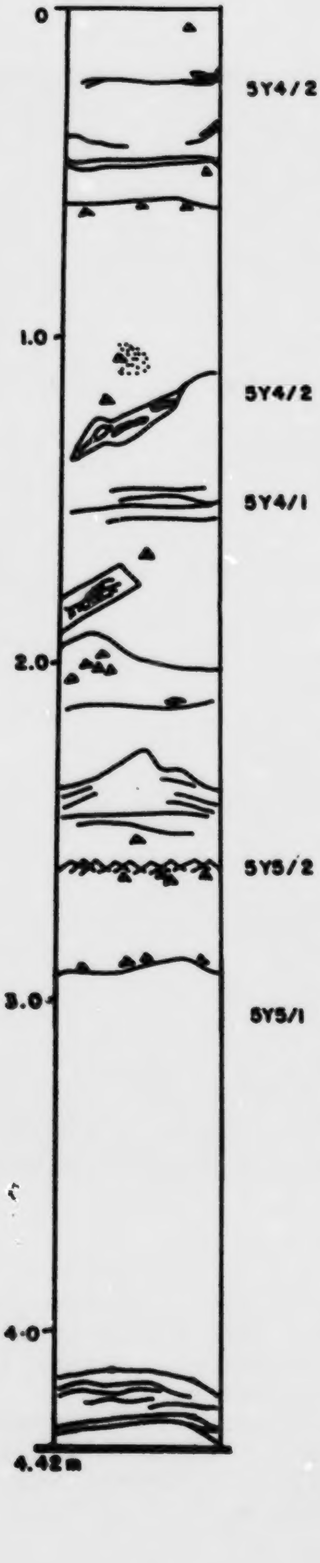


FIG. 12a. X-radiograph of Core CA3.0 from 159 to 182 cm to show fine structure.

FIG. 12b. Photograph of sand clasts in Core CA3.0 between 483 and 499 cm.



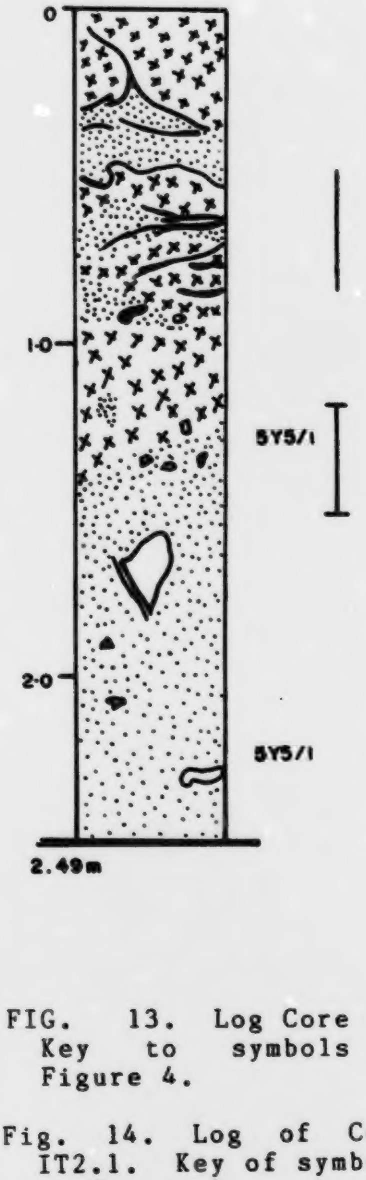
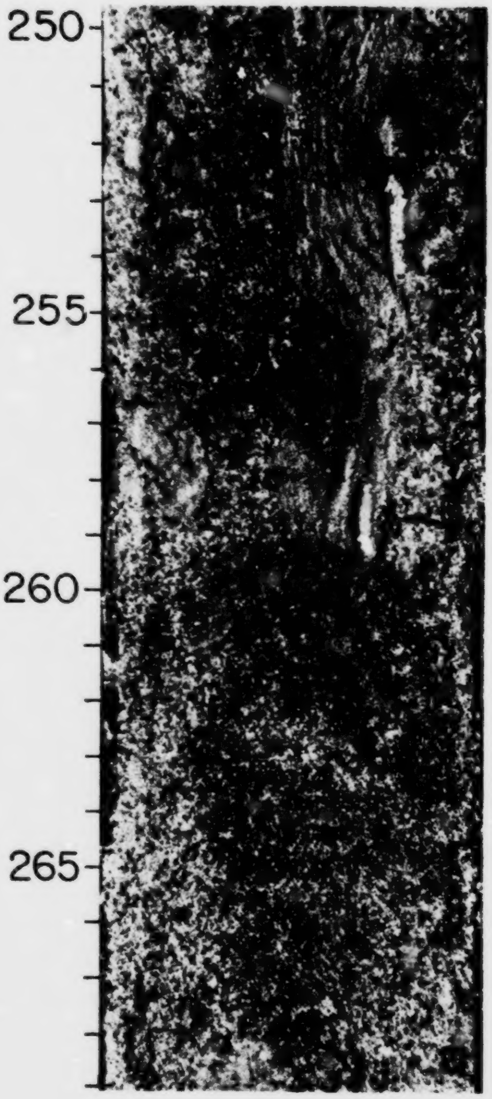
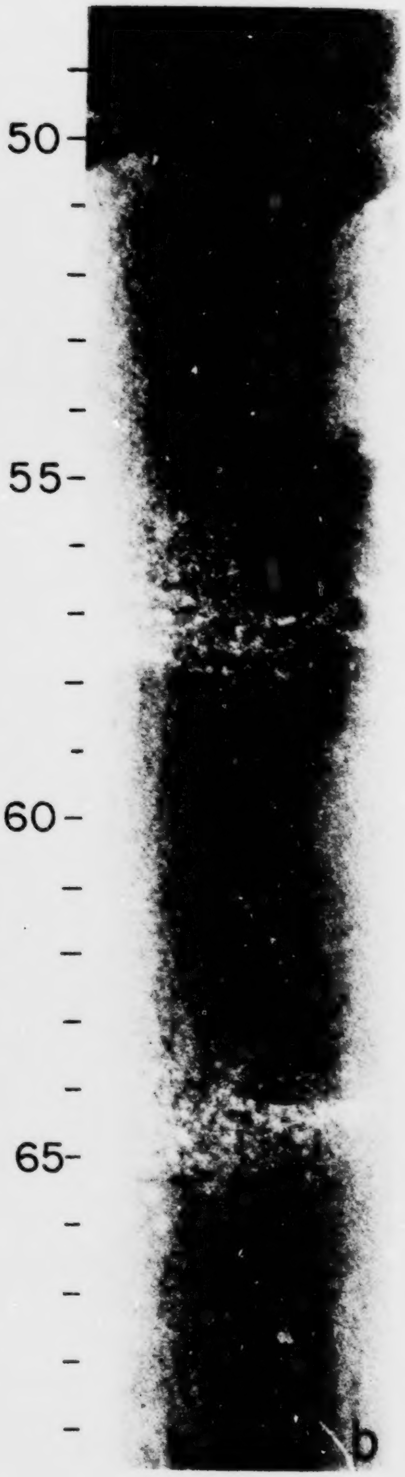


FIG. 13. Log Core CA6. Key to symbols in Figure 4.

Fig. 14. Log of Core IT2.1. Key of symbols in Figure 4.





IG. 15a. Photograph of fine-grained inclusion in Core IT2.1 from 250 to 260 cm.

FIG. 15b. X-radiograph of sand in core IT2.1 from 48 to 68 cm.

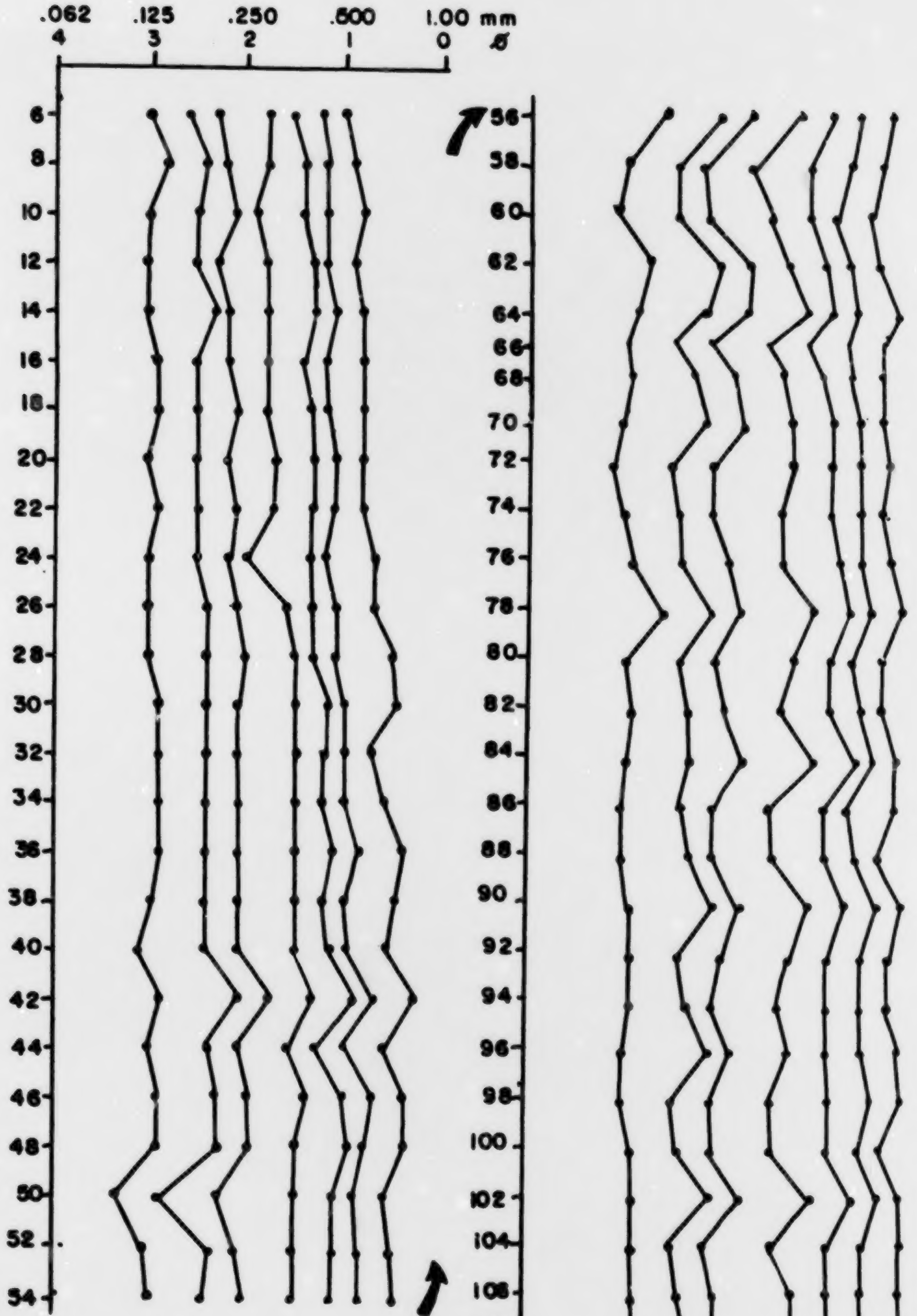


FIG. 16. Per cent coarser in samples at 2 cm intervals from sand lens from 6 to 110 cm in Core IT2.1.

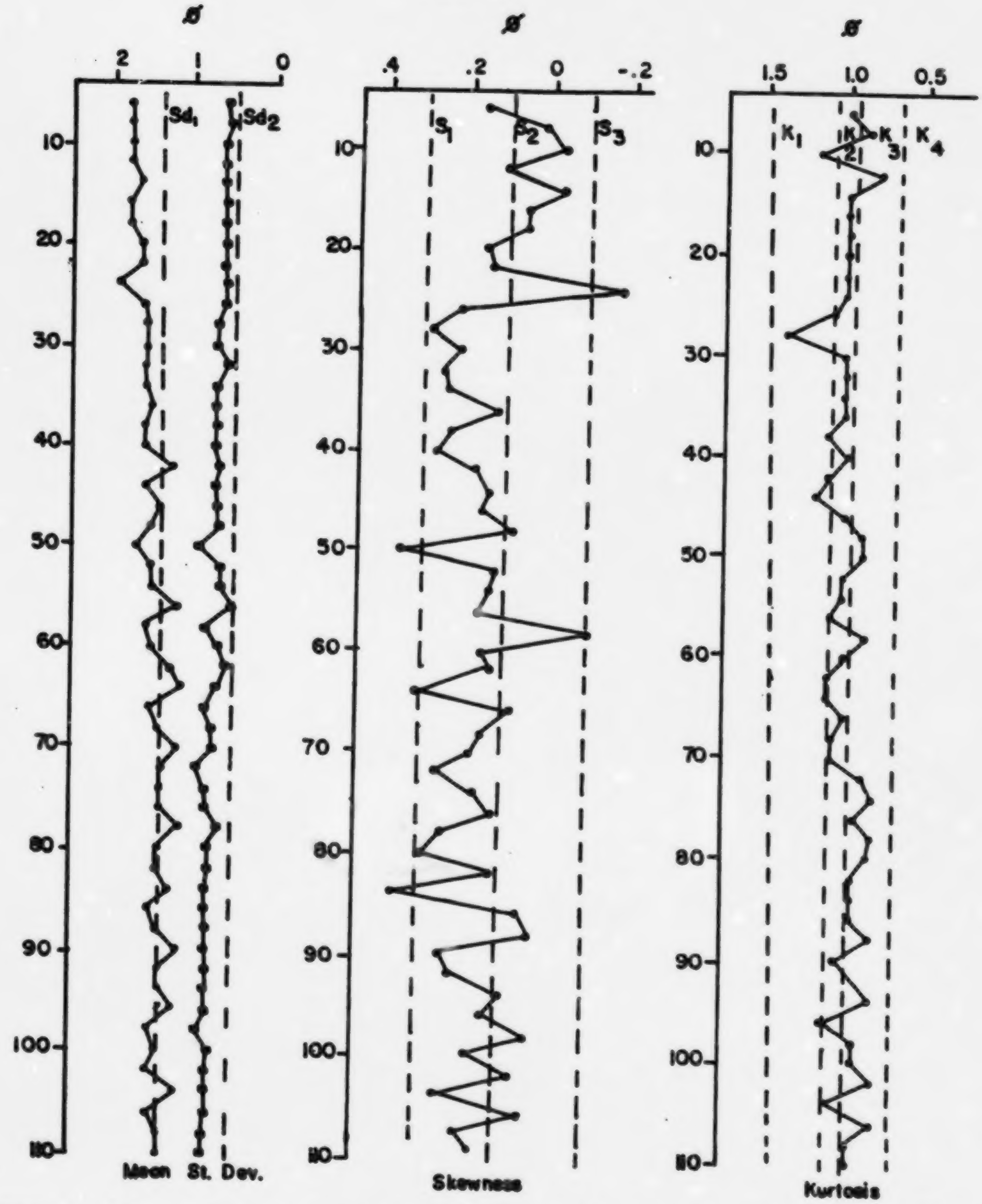


FIG. 17. Graphic mean, standard deviation, skewness, and kurtosis for samples from Core IT2.1 from 6 to 110 cm. Key to symbols in the caption to Figure 7.

CHAPTER 15:

QUATERNARY STUDIES ON BAFFIN ISLAND FIORD CORES

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INTRODUCTION

The object of the program at the University of Colorado is to study a series of the cores which were obtained in 1982 and 1983 in order to better understand the glacial/marine conditions over the last several thousand years. We are particularly interested in events during the glacial/interglacial transition, and in addition, we are curious about the relatively magnitude of change between the late glacial and the neoglacial (i.e. the last 2000-3000 years).

In this Data Report we primarily tabulate our initial results from a variety of studies that have been undertaken in our laboratories. Although our interests are largely in the area of reconstructing past environments from the viewpoint of Quaternary land/ice/sea interactions some of our research is more process oriented-- such as the sedimentological controls on the veractity of the paleomagnetic record.

Table 15-1 lists the cores that we are currently working on. For information we have also included some of the earlier HU- cores from the Baffin Island shelf that we are investigating. The chapter is organized as follows: in the next section we briefly review the methods that we use in obtaining our various data sets. Thereafter we present a series of tables that are organized by method and site. Thus Table 2 is a list of C-14 dates from all core sites, whereas Table 15-3A,B,C... and 15-4A,B... list grain-size data and paleomagnetic determinations from each core that we have studied to date. The order of the tables is listed in the Table of Contents preceeding this chapter.

Chapter 15 of this Data report ends with a list of theses accepted or in preparation, and papers and abstracts in press.

METHODS

1. Grain size: Air dried core material is dissaggregated through a 2000µm screen and material < 2000µm is subsampled to obtain a representative sample for analysis. Samples are reacted with Hydrogen Peroxide to oxidize organic matter and wet-sieved through a 44 µm screen. The 2000 - 44 µm fraction is dried, weighed and dry sieved through a nest of appropriate screens (15 min - RO Tap) and weights recorded. The pan fraction is added to the < 44µm material. The < 44µm material is analyzed by sedimentation with use of the Sedigraph 5000 D Particle Size Analyzer.

2. Carbonate Content: This is determined by a gasometric technique employing the Chittick apparatus (Dreimanis Method). Analyses are made on representative samples from the < 2000µm fraction milled to < 74µm. The method allows differentiation of calcite and dolomite and the computation of the calcite:dolomite ratio.

3. Organic Matter Content: This parameter is determined by Potassium Dichromate titration (Walkey-Black Method). Results are reported as % readily oxidizagble organic matter.

4. pH: Measured on representative samples with use of an Hach Meter and a preferred soil:water ration of 1:2.5.

5. Mass Physical Properties: Analyses include water content, specific gravity, wet unit weight, saturated void ratio, % porosity, atterberg limits and indices and activity. Sampling for mass physical properties was undertaken directly after cores were split to reduce error due to excess evaporation. The laboratory procedures and formulas followed are those detailed in Kravitz (1983).

6. Magnetic Susceptibility: Bulk low-field susceptibility was measured from the 3cc paleomag cubes by means of a sensitive bridge. Semi-continuous records of relative magnetic susceptibility were obtained with a Bartington's instrument employing a sensor loop through which the core was passed in 3-5 cm increments.

7. Paleomagnetic Measurements: Inclination, intensity and relative declination are measured at 5 cm intervals from the 3cc paleomag cubes. Step-wise a.f. demagnetization of several cubes from each core provides the basis for choosing a blanket a.f. demagnetization level for each core. All values are expressed in terms of unit volume. Measurements are made on the Schonstedt SSM-1A spinner (C.U. paleomagnetism lab) or a Schonstedt DSM-1 spinner (U.S.G.S.,Denver), and demagnetization is accomplished with a tumbler type apparatus.

8. Anhysteretic Remanent Magnetism (ARM): This is remanence acquired in the laboratory through the superposition of a small DC field (the earth's field) on a decaying AC field (peak field=1000 oe). ARM was measured in the Rock Magnetism laboratory at the U.S. Geological Survey in Denver.

9. Anisotropy of Susceptibility: Susceptibility ellipses determined at the C.U. paleomagnetics laboratory.

10. Clay and Clay-sized Mineralogy: A sample of the <2μm fraction is drawn from 4cm depth in the sediment slurry after 3hr. and 2 min. settling time. Oriented clay plates are made using the eye-dropper method from clays dispersed with Na Hexametaphosphate. Determination of the bulk mineralogy and clay mineralogy is made by x-ray diffraction employing the Rigaku Miniflex x-ray diffractometer (Cu K ; Ni-filtered radiation). Diagnostic scans include normal and glycolated (37°-4° 2 theta at 2° per min.), slow scan (25.25-24.5°2 theta at 1/2°per min.) and 325 and 550°C heat treatments (16-4° 2 theta at 2°per min.). Semi-quantification of the mineralogy is calculated from HP integrator areas (glycolated scan) multiplied by DSDP determined factors (Leg 28) and expressed as percentages.

11. 14 C: Radiocarbon ages determined from disseminated organic material or shell material using either the TAMS Facility at the Univ. of Arizona or Geochron.

12. Delta O 18: 10 to 30 specimens of *G. pachyderma* are picked. These are sent to the University of Quebec, Montreal, for determination of the oxygen isotope composition.

13. Foraminiferal Analysis: Typically, a 30 to 35 gram sediment sample is required (dry weight). Samples are soaked in a dilute solution of sodium hexametaphosphate for disaggregation; sonically agitated (<5 min.) for further disaggregation and washed through a 63μm sieve. If the >63μm fraction is large it is dry sieved on a 125μm screen and the >125μm fraction is floated in a bromoform/acetone mixture (specific gravity=2.65 g/cc) to concentrate the forams. Foraminifera in the float fraction are picked, identified and counted. A count of 300 is considered optimum. Species percentages are calculated and used as input in the Q-mode factor analysis program, CABFAC (Imbrie and Kipp, 1971).

14. Preparation Methods for Diatom Analysis: A representative sample weighing approximately 0.1 to 0.2 g is boiled for 2 minutes in dilute HCL in order to remove the carbonate. The remaining material is centrifuged and the supernatant decanted. The samples are washed with distilled water, centrifuged and decanted until no HCL remains. A few drops of the centrifuged sample are drawn off with a disposable pipette and smear slides made (mounting medium=Hyrax).

15. Pollen analysis

The chemical techniques for peat and moss polsters follow standard INSTAAR procedures for processing organic Arctic sedimets. These are detailed in Nichols (1975) and entail the use of caustic soda, acetolysis, and hydrofluoric acid on weighted samples. The use of an exotic additive tablet is employed for determining concentration values. The method used for preparing the marine sediments has been tested by W.N. Mode and combines chemical procedures used by Mudie (1980) and Cywnar et al. (1979). It is detailed here because the techniques involved are not widely known:

1. One Eucalyptus tablet was added to each weighed sample (dry weights from 3-6 grams).
2. 15 ml of 10% HCL was added and samples were placed in boiling water bath for 30 minutes.
3. After centrifuging and decanting, 20 ml of 0.1 M $Na_4P_2O_7$ (sodium pysophosphate) were added and samples were placed in boiling water bath for 30 minutes.
4. Samples were centrifuged at 3000 rpm for 5 minutes, then decanted.

Steps 3 & 4 were repeated until supernatent is virtually clear (no suspended clay).

5. 15 ml of 10% NaOH was added and samples were placed in water bath for 30 minutes (cent. and decant.).
6. 15 ml of HF was added; 90 minutes in boiling water bath plus standing in HF overnight (cent. and decant.).
7. Acetolysis solution (15 ml) was added and samples were placed in water bath for 45 minutes (cent. and decant.).

8. 20 ml of $Na_4P_2O_7$ was added; samples placed in boiling water bath for 30 minutes.
9. Samples sieved (while still in $Na_4P_2O_7$) thru 10 um NITEX screen.
10. Stained and mounted.

POLLEN

The following sets of samples have been prepared for pollen analysis:

1. McBeth Fiord Peat - 144-cm peat section sampled by J.T. Andrews, 1983 prepared at 10-cm intervals basal date = 1230±110 BP
2. Five moss polsters from sites adjacent to fiord cores, collected by J.T. Andrews, 1983
3. Sunneshine Fiord core, SU-5

The moss polster samples have been prepared to date. The pollen spectra are dominated by local taxa, especially Salix (willow), Gramineae (grass family), Caryophyllaceae (pink family), Potentilla (cinquefoil), and Saxifragaceae (saxifrage family). "Exotic" pollen types such as Alnus (alder), Betula (birch), Picea (spruce), and Pinus (pine) are present in low numbers, except in #719 (head of McBeth Fiord), which contains 8% Betula.

RADIOCARBON DATING

Over the last year we have developed a joint project with the tandem accelerator mass spectometry (TAMS) group at the University of Arizona. This is a research facility funded through the National Science Foundation. We have worked specifically with Dr T.Julls and his associated on the problem of obtaining dates from small (30-50mg) shell samples. In addition we have been comparing C-14 dates on shells and on total organic material (cf Fillon et al, 1981). Our main dating focus has been on EU77-159 in central Frobisher Bay, and on SU-5 (Table 15-2A). However, we have also obtained organic dates from other cores as listed in Table 15-2B.

A comparison of shell and organic dates from HU77-159 and SU-5 clearly indicates that organic dates are too old. Andrews and Julls(1984) suggest that given available shell/organic paired comparisons that organic dates can be corrected by the equation:

Corrected C-14= 1690.00 + 0.61(organic C-14 date).

In the next year we plan to date further samples. However, it is apparant from core descriptions and x-radiography that shells are not common and hence the C-14 program will most probably have to rely on corrected organic dates.

FORAMINIFERA

Foraminiferal zonation of six continental shelf cores and one fiord core are shown in Figures 15-6-1 and 15-6-2. Glacial sediments are indicated by the *Elphidium excavatum* forma *clavata* assemblage which are found only in the southern shelf cores. This assemblage in the fiord core HU82-031-SU5 is not believed to be related to glacial conditions, but is believed to be a response to lowered sea level. Late glacial sediments are dominated by *Cassidulina reniforme*.

The Holocene climatic optimum is believed to be represented by the high foraminiferal abundance and diversity of the Immigration Zones and the *Melonis zaandamae* Zone. The latter species is typical of warmer water and may represent a time when warmer Subarctic water occurred along the coast of Baffin Island. This Climatic Optimum lasted until shortly after 8,000 BP in all cores except HU78-36, where it lasted much longer. The later and more prolonged Climatic Optimum for this area agrees with Andrews (1972) who reported the presence of Subarctic mollusks in this vicinity until 2,500 BP. Our speculation is that the nearshore environment may have been protected for a longer time from the encroaching colder Arctic Water.

The arenaceous zone, at the top of the cores represents the Holocene dissolution of calcareous foraminifera, common to the coast of Baffin Island. The dissolution of calcareous foraminifera is probably related to the re-establishment of nearshore Arctic Water, and affects deeper and more northernly cores, before the shallower and southern cores.

DIATOMS IN CLARK FJORD GRABSAMPLES

Seven surface sediment samples (grabsamples) were examined for diatoms (table 15-7 A through H). Preparation procedures for diatom-containing sediment samples are outlined in Williams (1984).

Fig. 15-7-1 shows how the diatom flora changes along the fjord. In the inner reaches of the fjord, the dominating diatoms represented in the sediment are Navicula diploneoides and two species commonly found in and on the underside of ice, Nitzschia cylindrus and N. grunowii. Influence of the coastal diatoms is unremarkable at stations 1,2 and 5. Station 3 shows a stronger influence of the coastal flora than expected, but this can probably be attributed to its location - at the "confluence" of Clark fjord and Gibbs fjord.

From stations 6 to 8 the diatom flora changes into a coastal assemblage typical for the Baffin Current (Williams, 1984). This assemblage is generally dominated by Thalassiosira gravida spores, although smaller percentages of Actinocyclus curvatulus and T. trifulta, together with Porosira glacialis and Porosira spores are present.

Fig.(15-7-1) has been drawn without Chaetoceros spores, for the following reasons:

1) Chaetoceros spores are often so numerous that they totally dominate other species that have more restricted geographical distributions.

2) They are very fragile and seem to be the first diatoms to be dissolved or broken into small fragments. Therefore it might be incorrect to assume that they were never present in samples where they are not found.

3) Because they are easily fragmented, they are difficult to count accurately.

Chaetoceros spores have been included in the tables, where percentages are calculated both with and without thi species (tables 15-7-A through H).

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TABLE 15-1
CORES WORKING ON AT INSTAAR

CORE	LATITUDE LONGITUDE	WATER DEPTH (m)	LENGTH (m)	1 GRAIN SIZE	2 $CaCO_3$	3 ORGANIC MATTER	4 pH	5 MASS PHYSICAL PROPERTIES	6 MAGNETIC SUSCEPTIBILITY	7 PALEOMAG	8 ARM	9 ANISTROPY	10 CLAY MINERALOGY	11 ^{14}C	12 δO^{18}	13 FORAMINIFERA	14 DIATOMS	15 POLLEN
HU82-SUS	66°33.30" 61°42.60"	146	7.70	✓	✓	✓	✓	✓	✓	0	*	✓	✓	✓	0	✓	0	0
HU82-C04	67°15.20" 64°10.20"	356	10.90	✓	✓	✓	✓	✓	0	0	*	0	0	0	*	0	*	?
HU82-T13	69°11.50" 68°23.50"	487	11.41	0	0	0	0	*	✓	✓	*	*	0	✓	*	✓	0	?
HU82-CL5	71.05.50" 71°53.00"	683	10.16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	0
HU82-CL1	70.49.60" 72°37.00"	192	4.20	0	0	0	0	*	0	0	*	*	0	✓	*	0	0	0
HU83-CA 4.1	71°25.50" 74°45.70"	515	5.02	0	0	0	0	*	0	0	*	*	0	0	*	0	*	0
HU-83-CA4.2	71°25.50" 74°50.00"	365	4.79	*	*	*	*	*	0	0	*	?	*	0	*	?	?	?
HU83-IT. 1.1	69°20.00" 69°03.80"	256	6.80	0	0	0	0	*	0	0	*	*	0	0	*	0	*	?
HU83-It 2.2	68°54.00" 69°17.60"	400	8.20	0	0	0		*	0	0	?	?	0	0	?	0	*	?
HU83-It 3.1	69°17.60" 68°12.30"	365	4.83	0	0	0		*	0	0	?	?	0	0	?	0	*	0
HU83-Mc4.1	69°31.40" 69°57.00"	549	8.10	0	0	0		*	0	0	?	?	0	0	?	0	*	0
HU83-Mc83.6	69°40.70" 69°09.80"	429	2.80	0	0	0		*	0	0	?	?	0	0	?	0	*	?
HU76-26	70°26 70°17	500	1.44	✓	✓	✓	✓	*	*	*	*	*	✓	✓	0	✓	0	*
HU77-156	61°51.05" 64°12.03"	487	3.13	✓	✓	✓	✓	*	✓	✓	*	0	✓	✓	✓	✓	✓	0
HU77-157	62°38.04" 66°39.09"	497	2.15	✓	✓	✓	✓	*	*	*	*	*	0	✓	*	✓	*	*
HU77-159	62°50.05" 67°02.04"	570	9.69	✓	✓	✓	✓	*	✓	✓	*	0	✓	✓	x	✓	✓	✓
HU78-23	71°02.02" 71°29.06"	603	1.63	0	0	0	0	*	0	0	*	*	*	✓	*	0	0	*
HU78-24	71°13.02" 71°29.08"	832	5.81	✓	✓	✓	✓	*	✓	✓	✓		✓	✓	0	0	0	0
HU78-36	70°08.08" 66°48.07"	99	.93	✓	✓	✓	✓	*	x	x	x	*	*	✓	*	✓	0	*
HU78-37	68°15.05" 65°12.09"	457	5.93	✓	✓	✓	✓	*	x	x	x	x	✓	✓	0	✓	0	0

✓ = completed
0 = in progress or planned
* = not planned

TABLE 15-2-A

COMPARISON OF TOTAL ORGANIC AND SHELL DATES FROM TWO CORES, BAFFIN ISLAND, NWT,

SITE	DEPTH(cm)	ORG. ^{14}C DATE	WEIGHT(mg)	SHELL ^{14}C DATE	PREDICTED AGE
HU77-159	130-140	2745 ± 145			3364
	260-290	4560 ± 180			4471
	420-430	10025 ± 225	59	7790 ± 230 (AA-413)	7805
	860-920	11910 ± 380	18	8425 ± 375 (AA-191)	8955
HU82-031-SU5					
	165		52	5600 ± 360 (AA-712)	5655
	275-279	12190 ± 430 (AA-348)	46	9450 ± 360 (AA-412)	9125
	327-358	11365 ± 365			8622
	618	(17700 ±)*	41	13670 ± 360	12487
	660-684	22720^{+1420}_{-1210}		(15500 ±)	15549

*( ) estimated from interpolation

TABLE 15-2-B

BASAL CORE DATES FROM FIORD CORES, BAFFIN ISLAND, AND CORRECTED AGES BASED ON EQUATION 1.

FIORD	CORE #	^{14}C DATE	DEPTH	CORRECTED DATE
Tingin Fiord	TI3$	12,890+/-290 (AA-190)	1077-1108	9553
McBeth Fiord	MC4.1	16,700+/-900 (AA-653)	782-786	11,877
McBeth Fiord	MC83.6	19,200+/-1100	290-294	13,401

$ Core locations and other details are given in Table 15-1

TABLE 15-3-A

GRAIN SIZE ANALYSIS HU 82-031-CL5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY NUMBER	2000 1000	1000 500	500 250	250 125	125 63	63 31.2	31.2 15.6	15.6 7.8	7.8 3.9	3.9 1.95	1.95 0.98	0.98 0.49	< 0.49
GRL - 4301	0.00	0.10	1.31	6.84	28.06	31.67	13.57	4.45	2.55	2.55	1.91	2.12	4.88
(4.5cm.)	0.00	0.10	1.41	8.25	36.31	67.97	81.55	86.00	88.55	91.09	93.00	95.12	
- 4302	0.08	0.41	1.96	10.72	17.52	12.23	10.43	8.29	7.36	7.36	4.91	4.91	13.81
(28.0cm.)	0.08	0.49	2.45	13.18	30.70	42.92	53.36	61.64	69.01	76.37	81.28	86.19	
- 4303	0.29	0.16	1.00	10.37	14.25	9.01	10.54	8.84	8.50	7.82	6.12	6.80	16.32
(46.5cm.)	0.29	0.45	1.44	11.82	26.07	35.07	45.61	54.45	62.95	70.77	76.89	83.68	
- 4304	0.00	0.11	0.14	0.67	1.44	1.36	4.35	12.10	14.03	14.03	11.61	12.10	28.06
(57.0cm.)	0.00	0.11	0.25	0.91	2.35	3.72	8.07	20.17	34.20	48.23	59.84	71.94	
- 4305	0.24	0.75	1.37	6.57	30.67	25.93	11.91	4.68	3.40	2.55	2.34	2.13	7.45
(63.5cm.)	0.24	0.99	2.36	8.94	39.61	65.54	77.45	82.13	85.53	88.09	90.43	92.55	
- 4306	0.00	0.11	1.36	8.23	11.31	8.96	12.40	10.58	9.48	6.93	6.20	6.57	17.87
(74.5cm.)	0.00	0.11	1.47	9.70	21.01	29.97	42.37	52.95	62.43	69.36	75.56	82.13	
- 4307	0.00	0.05	0.79	7.57	11.93	10.61	12.79	10.59	8.77	6.58	5.85	5.48	19.00
(87.5cm.)	0.00	0.05	0.85	8.41	20.35	30.95	43.74	54.33	63.10	69.68	75.52	81.00	
- 4308	0.19	0.08	1.29	7.69	10.27	7.91	12.78	10.15	9.40	7.14	6.39	6.39	20.30
(98.0cm.)	0.19	0.27	1.57	9.26	19.53	27.43	40.22	50.37	59.77	66.91	73.30	79.70	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4301	36.31	52.24	11.45	SANDY SILT	0.22	5.06	2.40	1.76	5.79	-0.42
- 4302	30.70	38.31	30.99	SAND-SILT-CLAY	0.81	6.46	3.35	0.54	2.12	-0.51
- 4303	26.07	36.88	37.05	SAND-SILT-CLAY	1.00	6.97	3.42	0.30	1.90	-0.51
- 4304	2.35	31.84	65.80	SILTY CLAY	2.07	9.28	2.55	-0.24	2.33	-0.29
- 4305	39.61	45.93	14.47	SANDY SILT	0.31	5.24	2.75	1.46	4.50	-0.45
- 4306	21.01	41.42	37.57	SAND-SILT-CLAY	0.91	7.21	3.35	0.27	1.90	-0.50
- 4307	20.35	42.76	36.90	SAND-SILT-CLAY	0.86	7.21	3.35	0.34	1.88	-0.53
- 4308	19.53	40.24	40.23	CLAYEY SILT	1.00	7.42	3.41	0.18	1.85	-0.49

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4301	25.30	0.00	0.00	0.00	0.00	0.00	0.00	36.31	52.24	11.45
- 4302	21.94	0.00	0.00	0.00	0.00	0.00	0.00	30.70	38.31	30.99
- 4303	24.06	0.21	0.00	0.00	0.21	0.00	0.21	26.01	36.80	36.97
- 4304	20.54	0.00	0.00	0.00	0.00	0.00	0.00	2.35	31.84	65.80
- 4305	26.75	0.00	0.00	0.00	0.00	0.00	0.00	39.61	45.93	14.47
- 4306	20.99	0.10	0.00	0.00	0.10	0.00	0.10	20.99	41.38	37.53
- 4307	24.78	0.00	0.00	0.00	0.00	0.00	0.00	20.35	42.76	36.90
- 4308	20.19	0.00	0.00	0.00	0.00	0.00	0.00	19.53	40.24	40.23

TABLE 15-3-A (cont.)
GRAIN SIZE ANALYSIS HU82-031-CL5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT
[Size Separates Expressed In Microns]

LABORATORY NUMBER	2000 1000	1000 500	500 250	250 125	125 63	63 31.2	31.2 15.6	15.6 7.8	7.8 3.9	3.9 1.95	1.95 0.98	0.98 0.49	< 0.49
GRL - 4309	0.00	0.08	1.44	7.69	11.02	8.68	12.16	8.84	8.84	6.63	6.26	6.26	22.10
(110.5cm.)	0.00	0.08	1.53	9.21	20.23	28.91	41.07	49.91	58.75	65.38	71.64	77.90	
- 4310	0.00	0.12	1.28	6.11	9.26	8.58	11.66	9.72	8.94	7.00	7.00	7.39	22.94
(123.5cm.)	0.00	0.12	1.40	7.51	16.77	25.35	37.02	46.74	55.68	62.68	69.67	77.06	
- 4311	0.00	0.08	1.11	5.05	5.97	6.00	10.96	10.96	9.27	8.85	7.17	8.43	26.14
(152.5cm.)	0.00	0.08	1.19	6.24	12.22	18.22	29.18	40.14	49.42	58.27	65.43	73.86	
- 4312	0.00	0.08	1.81	9.26	10.14	8.08	9.24	8.87	8.87	7.40	5.55	7.03	23.67
(165.5cm.)	0.00	0.08	1.88	11.15	21.29	29.37	38.61	47.49	56.36	63.76	69.31	76.33	
- 4290	0.00	0.11	1.54	6.23	7.96	7.84	10.28	8.70	10.28	7.12	7.12	8.30	24.52
(176.0cm.)	0.00	0.11	1.65	7.89	15.85	23.69	33.97	42.67	52.95	60.06	67.18	75.48	
- 4313	0.00	0.05	0.68	4.26	6.95	7.96	11.62	9.96	9.13	8.71	6.64	6.64	27.39
(186.5cm.)	0.00	0.05	0.74	5.00	11.95	19.91	31.53	41.49	50.62	59.33	65.97	72.61	
- 4314	0.23	0.26	1.14	6.14	9.55	9.50	10.84	9.29	8.52	7.36	6.19	6.58	24.39
(198.5cm.)	0.23	0.49	1.63	7.77	17.32	26.82	37.66	46.96	55.47	62.83	69.03	75.61	
- 4315	0.00	0.44	5.02	13.77	11.98	8.65	9.55	7.96	6.37	6.05	5.09	5.41	19.73
(212.5cm.)	0.00	0.44	5.45	19.22	31.20	39.84	49.39	57.35	63.72	69.76	74.86	80.27	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	FHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4309	20.23	38.52	41.25	SAND-SILT-CLAY	1.07	7.48	3.48	0.18	1.74	-0.55
- 4310	16.77	38.91	44.32	SILTY CLAY	1.14	7.73	3.42	0.08	1.75	-0.53
- 4311	12.22	37.20	50.58	SILTY CLAY	1.36	8.22	3.32	-0.10	1.83	-0.49
- 4312	21.29	35.07	43.64	SAND-SILT CLAY	1.24	7.58	3.57	0.08	1.69	-0.56
- 4290	15.85	37.10	47.05	SILTY CLAY	1.27	7.93	3.44	-0.03	1.76	-0.52
- 4313	11.95	38.67	49.38	SILTY CLAY	1.28	8.18	3.34	-0.02	1.73	-0.54
- 4314	17.32	38.15	44.53	SILTY CLAY	1.17	7.73	3.49	0.07	1.75	-0.53
- 4315	31.20	32.52	36.28	SAND-SILT CLAY	1.12	6.78	3.73	0.32	1.75	-0.59

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4309	23.22	0.00	0.00	0.00	0.00	0.00	0.00	20.23	38.52	41.25
- 4310	23.54	0.00	0.00	0.00	0.00	0.00	0.00	16.77	38.91	44.32
- 4311	22.66	0.00	0.00	0.00	0.00	0.00	0.00	12.22	37.20	50.58
- 4312	21.13	0.00	0.00	0.00	0.00	0.00	0.00	21.29	35.07	43.64
- 4290	104.07	0.00	0.00	0.00	0.00	0.00	0.00	15.85	37.10	47.05
- 4313	24.34	0.00	0.00	0.00	0.00	0.00	0.00	11.95	38.67	49.38
- 4314	24.74	0.00	0.00	0.00	0.00	0.00	0.00	17.32	38.15	44.53
- 4315	27.41	0.00	0.00	0.00	0.00	0.00	0.00	31.20	32.52	36.28

TABLE 15-3-A (cont.)
GRAIN SIZE ANALYSIS HU82-031-CL5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT
[Size Separates Expressed In Microns]

LABORATORY	2000	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	<
NUMBER	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	0.49	0.49
GRL - 4316	0.14	0.08	0.41	2.57	5.55	7.94	11.34	10.03	10.03	8.72	7.42	8.72	27.04
(227.0cm.)	0.14	0.22	0.62	3.20	8.75	16.69	28.03	38.06	48.09	56.82	64.23	72.96	
- 4317	0.00	0.00	0.50	2.55	4.57	6.96	10.68	10.23	9.79	9.34	8.01	9.34	28.03
(240.0cm.)	0.00	0.00	0.50	3.05	7.62	14.58	25.26	35.49	45.28	54.62	62.63	71.97	
- 4318	0.00	0.06	0.36	1.15	1.99	3.91	7.59	10.91	10.91	10.91	9.96	12.34	29.89
(272.5cm.)	0.00	0.06	0.42	1.57	3.56	7.48	15.07	25.98	36.89	47.81	57.77	70.11	
- 4319	0.61	0.24	0.61	1.25	2.07	4.27	8.40	10.73	11.19	11.19	9.79	12.59	27.05
(288.5cm.)	0.61	0.85	1.46	2.71	4.78	9.05	17.45	28.17	39.37	50.56	60.36	72.95	
- 4320	0.00	0.39	1.06	1.84	2.18	2.62	3.27	7.46	13.06	14.00	12.13	15.86	26.12
(311.5cm.)	0.00	0.39	1.45	3.30	5.48	8.10	11.36	18.83	31.89	45.89	58.01	73.88	
- 4321	0.00	0.00	0.04	0.04	0.07	0.10	0.07	4.39	16.46	15.47	15.47	18.46	29.44
(323.5cm.)	0.00	0.00	0.04	0.07	0.14	0.24	0.31	4.70	21.17	36.64	52.10	70.56	
- 4291	0.00	0.33	1.68	4.33	4.72	4.86	9.05	9.05	11.64	9.05	9.05	10.78	25.44
(389.0cm.)	0.00	0.33	2.01	6.34	11.06	15.92	24.98	34.03	45.67	54.73	63.78	74.56	
- 4322	0.00	0.00	0.03	0.05	0.05	0.10	0.07	7.88	16.97	14.47	14.97	17.46	27.94
(381.0cm.)	0.00	0.00	0.03	0.08	0.13	0.23	0.30	8.19	25.15	39.62	54.59	72.06	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4316	8.75	39.34	51.91	SILTY CLAY	1.32	8.39	3.21	-0.09	1.82	-0.49
- 4317	7.62	37.66	54.72	SILTY CLAY	1.45	8.57	3.15	-0.15	1.83	-0.50
- 4318	3.56	33.33	63.11	SILTY CLAY	1.89	9.13	2.84	-0.32	2.11	-0.41
- 4319	4.78	34.59	60.63	SILTY CLAY	1.75	8.89	2.96	-0.42	2.57	-0.25
- 4320	5.48	26.41	68.11	SILTY CLAY	2.58	9.18	2.77	-0.63	3.01	-0.20
- 4321	0.14	21.03	78.83	CLAY	3.75	9.93	2.00	-0.05	1.95	-0.42
- 4291	11.06	34.61	54.33	SILTY CLAY	1.57	8.42	3.25	-0.28	2.06	-0.42
- 4322	0.13	25.03	74.85	SILTY CLAY	2.99	9.78	2.07	0.00	1.88	-0.46

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4316	23.32	0.00	0.00	0.00	0.00	0.00	0.00	8.75	39.34	51.91
- 4317	21.40	0.00	0.00	0.00	0.00	0.00	0.00	7.62	37.66	54.72
- 4318	23.80	0.00	0.00	0.00	0.00	0.00	0.00	3.56	33.33	63.11
- 4319	20.92	0.00	0.00	0.00	0.00	0.00	0.00	4.78	34.59	60.63
- 4320	28.71	4.32	4.32	0.00	0.00	4.32	0.00	5.24	25.27	65.17
- 4321	19.89	0.00	0.00	0.00	0.00	0.00	0.00	0.14	21.03	78.83
- 4291	223.01	0.18	0.00	0.13	0.04	0.13	0.04	11.04	34.55	54.23
- 4322	23.01	0.00	0.00	0.00	0.00	0.00	0.00	0.13	25.03	74.85

TABLE 15-3-A (cont.)
GRAIN SIZE ANALYSIS HU 82-031-CL5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY	2000	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	<
NUMBER	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	0.49	0.49
GRL - 4323	0.00	0.00	0.04	0.04	0.08	0.11	0.07	8.88	15.96	14.96	14.46	17.95	27.43
(405.0cm.)	0.00	0.00	0.04	0.08	0.17	0.28	0.35	9.23	25.19	40.15	54.62	72.57	
- 4292	0.00	0.00	0.04	0.04	0.08	0.11	0.97	6.98	16.46	15.46	13.96	17.46	28.43
(425.0cm.)	0.00	0.00	0.04	0.08	0.17	0.28	1.25	8.23	24.69	40.15	54.12	71.57	
- 4324	0.00	0.00	0.03	0.03	0.05	0.08	0.97	9.98	14.98	14.98	14.48	16.97	27.46
(446.0cm.)	0.00	0.00	0.03	0.05	0.10	0.18	1.15	11.14	26.12	41.09	55.57	72.54	
- 4325	0.00	0.00	0.03	0.06	0.06	0.08	0.97	7.98	16.47	15.47	14.47	16.97	27.45
(455.0cm.)	0.00	0.00	0.03	0.09	0.14	0.22	1.20	9.18	25.65	41.12	55.59	72.55	
- 4326	0.00	0.00	0.03	0.03	0.05	0.08	0.97	9.49	17.47	13.48	13.98	17.47	26.96
(505.0cm.)	0.00	0.00	0.03	0.05	0.10	0.18	1.15	10.64	28.11	41.59	55.57	73.04	
- 4327	0.00	0.00	0.03	0.03	0.03	0.05	0.97	10.49	16.98	13.99	13.49	16.48	27.47
(555.0cm.)	0.00	0.00	0.03	0.05	0.08	0.13	1.10	11.59	28.57	42.56	56.05	72.53	
- 4328	0.00	0.00	0.05	0.05	0.03	0.05	0.97	12.98	16.97	13.48	12.98	15.48	26.96
(605.0cm.)	0.00	0.00	0.05	0.10	0.13	0.18	1.15	14.13	31.11	44.59	57.57	73.04	
- 4329	0.00	0.00	0.03	0.03	0.03	0.06	1.97	13.98	15.98	13.98	12.98	14.48	26.47
(655.0cm.)	0.00	0.00	0.03	0.06	0.09	0.15	2.12	16.10	32.08	46.07	59.05	73.53	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4323	0.17	25.02	74.81	SILTY CLAY	2.99	9.75	2.08	-0.02	1.93	-0.43
- 4292	0.17	24.52	75.31	CLAY	3.07	9.78	2.10	-0.05	1.96	-0.42
- 4324	0.10	26.01	73.88	SILTY CLAY	2.84	9.69	2.13	-0.01	1.87	-0.46
- 4325	0.14	25.51	74.35	SILTY CLAY	2.92	9.72	2.10	-0.01	1.93	-0.44
- 4326	0.10	28.01	71.89	SILTY CLAY	2.57	9.66	2.13	0.01	1.85	-0.47
- 4327	0.08	28.50	71.43	SILTY CLAY	2.51	9.65	2.15	0.03	1.80	-0.50
- 4328	0.13	30.98	68.89	SILTY CLAY	2.22	9.55	2.20	0.05	1.81	-0.50
- 4329	0.09	31.99	67.92	SILTY CLAY	2.12	9.47	2.23	0.08	1.78	-0.51

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATLRY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4323	19.95	0.00	0.00	0.00	0.00	0.00	0.00	0.17	25.02	74.81
- 4292	336.97	0.00	0.00	0.00	0.00	0.00	0.00	0.17	24.52	75.31
- 4324	21.80	0.00	0.00	0.00	0.00	0.00	0.00	0.10	26.01	73.88
- 4325	23.34	0.00	0.00	0.00	0.00	0.00	0.00	0.14	25.51	74.35
- 4326	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	28.01	71.89
- 4327	20.45	0.00	0.00	0.00	0.00	0.00	0.00	0.08	28.50	71.43
- 4328	20.28	0.00	0.00	0.00	0.00	0.00	0.00	0.13	30.98	68.89
- 4329	25.42	0.00	0.00	0.00	0.00	0.00	0.00	0.09	31.99	67.92

TABLE 15-3-A (cont.)
GRAIN SIZE ANALYSIS HU82-031-CL5
<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT
[Size Separates Expressed In Microns]

LABORATORY	2000	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	<
NUMBER	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	0.49	0.49
GRL - 4330	0.00	0.00	0.03	0.03	0.03	0.05	3.47	15.48	16.98	12.99	11.49	14.48	24.97
(693.0cm.)	0.00	0.00	0.03	0.05	0.08	0.13	3.60	19.09	36.07	49.05	60.54	75.03	
- 4331	0.00	0.00	0.03	0.03	0.03	1.03	6.99	21.48	15.48	11.49	9.99	10.49	22.98
(753.0cm.)	0.00	0.00	0.03	0.05	0.08	1.10	8.10	29.57	45.06	56.55	66.54	77.02	
- 4332	0.00	0.00	0.03	0.03	0.05	1.03	9.49	23.47	14.98	10.99	10.49	9.99	19.47
(772.0cm.)	0.00	0.00	0.03	0.05	0.11	1.13	10.62	34.09	49.07	60.05	70.54	80.53	
- 4333	0.00	0.00	0.05	0.03	0.03	1.05	9.49	26.46	13.98	9.98	8.99	8.49	21.47
(802.5cm.)	0.00	0.00	0.05	0.08	0.10	1.15	10.64	37.10	51.08	61.06	70.05	78.53	
- 4334	0.00	0.00	0.03	0.03	0.05	0.08	10.46	23.96	14.98	9.98	9.48	9.48	21.47
(829.0cm.)	0.00	0.00	0.03	0.05	0.11	0.18	10.64	34.60	49.58	59.56	69.05	78.53	
- 4335	0.00	0.00	0.05	0.03	0.05	1.05	1.50	14.97	17.47	12.48	11.98	14.47	25.95
(845.0cm.)	0.00	0.00	0.05	0.08	0.13	1.18	2.68	17.65	35.12	47.60	59.57	74.05	
- 4336	0.00	0.00	0.03	0.03	0.05	0.53	2.00	15.48	16.48	13.98	11.48	14.48	25.47
(902.5cm.)	0.00	0.00	0.03	0.05	0.11	0.63	2.63	18.11	34.59	48.57	60.05	74.53	
- 4337	0.00	0.00	0.03	0.03	0.03	0.05	4.47	17.98	16.48	12.49	11.49	13.49	23.47
(953.5cm.)	0.00	0.00	0.03	0.05	0.08	0.13	4.60	22.58	39.07	51.55	63.04	76.53	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4330	0.08	35.99	63.93	SILTY CLAY	1.78	9.31	2.28	0.13	1.76	-0.53
- 4331	0.08	44.98	54.94	SILTY CLAY	1.22	8.89	2.44	0.29	1.79	-0.56
- 4332	0.11	48.96	50.93	SILTY CLAY	1.04	8.63	2.41	0.41	1.92	-0.54
- 4333	0.10	50.97	48.92	CLAYEY SILT	0.96	8.62	2.48	0.44	1.86	-0.59
- 4334	0.11	49.47	50.42	SILTY CLAY	1.02	8.69	2.46	0.41	1.81	-0.60
- 4335	0.13	34.99	64.88	SILTY CLAY	1.85	9.38	2.29	0.06	1.84	-0.48
- 4336	0.11	34.48	65.41	SILTY CLAY	1.90	9.36	2.27	0.11	1.80	-0.51
- 4337	0.08	38.99	60.93	SILTY CLAY	1.56	9.16	2.31	0.20	1.78	-0.54

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4330	23.62	0.00	0.00	0.00	0.00	0.00	0.00	0.08	35.99	63.93
- 4331	26.49	0.00	0.00	0.00	0.00	0.00	0.00	0.08	44.98	54.94
- 4332	25.68	0.00	0.00	0.00	0.00	0.00	0.00	0.11	48.96	50.93
- 4333	25.40	0.00	0.00	0.00	0.00	0.00	0.00	0.10	50.97	48.92
- 4334	27.73	0.00	0.00	0.00	0.00	0.00	0.00	0.11	49.47	50.42
- 4335	23.15	0.00	0.00	0.00	0.00	0.00	0.00	0.13	34.99	64.88
- 4336	25.01	0.00	0.00	0.00	0.00	0.00	0.00	0.11	34.48	65.41
- 4337	25.64	0.00	0.00	0.00	0.00	0.00	0.00	0.08	38.99	60.93

TABLE 15-3-A (cont.)
GRAIN SIZE ANALYSIS HU82-031-CL5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY NUMBER	2000 1000	1000 500	500 250	250 125	125 63	63 31.2	31.2 15.6	15.6 7.8	7.8 3.9	3.9 1.95	1.95 0.98	0.98 0.49	< 0.49
GRL - 4293	0.00	0.00	0.04	0.04	0.04	0.54	5.49	17.97	16.47	11.48	10.48	12.48	24.96
(971.5cm.)	0.00	0.00	0.04	0.08	0.12	0.65	6.15	24.12	40.59	52.07	62.56	75.04	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4293	0.12	40.48	59.41	SILTY CLAY	1.47	9.14	2.40	0.17	1.75	-0.54

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4293	356.05	0.00	0.00	0.00	0.00	0.00	0.00	0.12	40.48	59.41

TABLE 15-3-B
GRAIN SIZE ANALYSIS HU82-031-SU5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY	2000	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	<
NUMBER	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	0.49	0.49
GRL - 4338	0.00	0.00	0.25	0.81	3.48	8.47	15.86	14.95	13.14	9.97	7.70	8.61	16.76
(19.0cm.)	0.00	0.00	0.25	1.06	4.54	13.01	28.87	43.82	56.96	66.93	74.63	83.24	
- 4339	0.09	0.06	0.34	0.86	4.16	10.64	17.30	15.53	12.42	9.76	6.21	7.10	15.53
(45.0cm.)	0.09	0.15	0.49	1.36	5.51	16.16	33.46	48.98	61.41	71.16	77.38	84.47	
- 4340	0.00	0.07	0.24	0.75	3.66	10.63	19.71	15.68	13.44	8.96	5.82	6.27	14.78
(64.0cm.)	0.00	0.07	0.31	1.05	4.72	15.34	35.05	50.73	64.17	73.13	78.95	85.22	
- 4341	0.00	0.03	0.34	0.81	3.44	10.15	18.49	16.68	13.08	9.47	5.86	6.76	14.88
(84.5cm.)	0.00	0.03	0.38	1.19	4.63	14.78	33.27	49.95	63.03	72.50	78.36	85.12	
- 4342	0.09	0.09	0.28	0.76	3.33	11.05	20.20	17.06	12.12	8.98	5.39	5.84	14.81
(103.0cm.)	0.09	0.18	0.46	1.22	4.56	15.60	35.80	52.86	64.98	73.96	79.35	85.19	
- 4343	0.00	0.00	0.35	0.91	4.20	11.54	22.84	16.69	12.74	7.90	4.39	4.83	13.61
(125.0cm.)	0.00	0.00	0.35	1.26	5.46	17.00	39.84	56.52	69.26	77.16	81.56	86.39	
- 4344	0.00	0.03	0.40	1.20	5.00	14.68	23.52	15.82	11.12	7.27	3.85	3.85	13.26
(145.cm.)	0.00	0.03	0.43	1.64	6.64	21.32	44.84	60.66	71.78	79.05	82.89	86.74	
- 4345	0.00	0.13	0.76	1.13	3.82	13.67	23.49	15.23	12.18	6.96	4.35	4.35	13.92
(162. 0cm.)	0.00	0.13	0.90	2.03	5.85	19.51	43.01	58.23	70.42	77.38	81.73	86.08	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4338	4.54	52.42	43.04	CLAYEY SILT	0.82	7.93	2.77	0.31	2.09	-0.42
- 4339	5.51	55.89	38.59	CLAYEY SILT	0.69	7.65	2.80	0.41	2.25	-0.38
- 4340	4.72	59.45	35.83	CLAYEY SILT	0.60	7.56	2.73	0.54	2.33	-0.42
- 4341	4.63	58.40	36.97	CLAYEY SILT	0.63	7.62	2.73	0.50	2.30	-0.40
- 4342	4.56	60.43	35.02	CLAYEY SILT	0.58	7.51	2.74	0.56	2.41	-0.39
- 4343	5.46	63.80	30.74	CLAYEY SILT	0.48	7.29	2.70	0.71	2.58	-0.42
- 4344	6.64	65.14	28.22	CLAYEY SILT	0.43	7.07	2.73	0.79	2.71	-0.43
- 4345	5.85	64.57	29.58	CLAYEY SILT	0.46	7.19	2.77	0.69	2.61	-0.40

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4338	17.91	0.00	0.00	0.00	0.00	0.00	0.00	4.54	52.42	43.04
- 4339	19.56	0.00	0.00	0.00	0.00	0.00	0.00	5.51	55.89	38.59
- 4340	19.32	0.00	0.00	0.00	0.00	0.00	0.00	4.72	59.45	35.83
- 4341	21.55	0.00	0.00	0.00	0.00	0.00	0.00	4.63	58.40	36.97
- 4342	20.40	0.00	0.00	0.00	0.00	0.00	0.00	4.56	60.43	35.02
- 4343	25.23	0.12	0.00	0.00	0.12	0.00	0.12	5.45	63.73	30.70
- 4344	25.07	2.07	0.00	2.07	0.00	2.07	0.00	6.50	63.79	27.64
- 4345	26.98	0.15	0.00	0.00	0.15	0.00	0.15	5.84	64.47	29.54

TABLE 15-3-B (cont.)
GRAIN SIZE ANALYSIS HU82-031-SU5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY NUMBER	2000 1000	1000 500	500 250	250 125	125 63	63 31.2	31.2 15.6	15.6 7.8	7.8 3.9	3.9 1.95	1.95 0.98	0.98 0.49	< 0.49
GRL - 4346	0.00	0.06	0.30	0.72	3.24	12.78	24.07	15.60	10.70	7.58	4.01	4.90	16.04
(183.5cm.)	0.00	0.06	0.36	1.08	4.32	17.10	41.17	56.77	67.47	75.04	79.05	83.96	
- 4347	0.20	0.17	0.25	0.65	6.38	23.97	22.39	10.80	7.20	5.20	4.00	4.80	14.00
(203.5cm.)	0.20	0.37	0.62	1.27	7.65	31.62	54.01	64.81	72.01	77.21	81.20	86.00	
- 4348	0.09	0.09	0.12	0.56	5.69	21.84	26.60	12.69	7.78	4.09	3.27	3.68	13.50
(223.5cm.)	0.09	0.18	0.30	0.86	6.55	28.39	54.99	67.67	75.45	79.54	82.81	86.50	
- 4349	0.00	0.00	0.15	0.57	5.80	24.47	25.32	12.66	6.94	3.27	3.68	4.08	13.07
(243.5cm.)	0.00	0.00	0.15	0.72	6.52	30.98	56.30	68.96	75.91	79.17	82.85	86.93	
- 4350	0.00	0.06	0.12	0.51	4.63	20.21	25.38	14.38	8.46	4.65	3.38	4.65	13.54
(263.5cm.)	0.00	0.06	0.18	0.70	5.33	25.54	50.93	65.31	73.77	78.42	81.81	86.46	
- 4351	0.18	0.18	0.12	0.51	3.74	18.52	26.01	15.17	9.10	5.20	3.47	3.90	13.87
(293.5cm.)	0.18	0.36	0.48	1.00	4.74	23.26	49.27	64.45	73.55	78.76	82.22	86.13	
- 4352	0.00	0.03	0.12	0.45	3.03	16.11	23.63	15.16	10.26	5.80	5.35	5.35	14.71
(321.5cm.)	0.00	0.03	0.15	0.59	3.63	19.74	43.37	58.53	68.79	74.58	79.94	85.29	
- 4294	0.00	0.00	0.13	0.56	3.59	16.94	24.07	13.57	9.63	6.13	4.81	5.25	15.32
(342.5cm.)	0.00	0.00	0.13	0.69	4.29	21.22	45.29	58.86	68.49	74.62	79.43	84.68	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4346	4.32	63.14	32.53	CLAYEY SILT	0.52	7.40	2.80	0.68	2.36	-0.50
- 4347	7.65	64.36	27.99	CLAYEY SILT	0.43	6.87	2.91	0.82	2.57	-0.51
- 4348	6.55	68.90	24.55	CLAYEY SILT	0.36	6.80	2.80	0.99	2.87	-0.54
- 4349	6.52	69.39	24.09	CLAYEY SILT	0.35	6.75	2.79	1.03	2.86	-0.59
- 4350	5.33	68.44	26.23	CLAYEY SILT	0.38	6.95	2.77	0.93	2.71	-0.56
- 4351	4.74	68.81	26.45	CLAYEY SILT	0.38	6.99	2.77	0.87	2.80	-0.47
- 4352	3.63	65.16	31.21	CLAYEY SILT	0.48	7.30	2.77	0.75	2.39	-0.54
- 4294	4.29	64.20	31.51	CLAYEY SILT	0.49	7.28	2.82	0.74	2.33	-0.56

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4346	26.37	0.08	0.00	0.00	0.08	0.00	0.08	4.32	63.10	32.51
- 4347	27.97	0.11	0.00	0.00	0.11	0.00	0.11	7.64	64.29	27.96
- 4348	32.47	0.00	0.00	0.00	0.00	0.00	0.00	6.55	68.90	24.55
- 4349	31.02	0.00	0.00	0.00	0.00	0.00	0.00	6.52	69.39	24.09
- 4350	28.34	0.00	0.00	0.00	0.00	0.00	0.00	5.33	68.44	26.23
- 4351	28.70	0.28	0.00	0.00	0.28	0.00	0.28	4.73	68.62	26.37
- 4352	28.08	0.00	0.00	0.00	0.00	0.00	0.00	3.63	65.16	31.21
- 4294	334.34	0.03	0.00	0.00	0.03	0.00	0.03	4.29	64.18	31.50

TABLE 15-3-B (cont.)
GRAIN SIZE ANALYSIS HU82-031-SU5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY NUMBER	2000 1000	1000 500	500 250	250 125	125 63	63 31.2	31.2 15.6	15.6 7.8	7.8 3.9	3.9 1.95	1.95 0.98	0.98 0.49	< 0.49
GRL - 4353	0.00	0.00	0.20	0.47	2.11	12.82	23.98	15.68	9.22	6.46	5.53	6.00	17.53
(374.5cm.)	0.00	0.00	0.20	0.67	2.78	15.60	39.58	55.26	64.49	70.94	76.48	82.47	
- 4354	0.00	0.00	0.09	0.31	0.74	4.15	20.88	17.48	11.17	8.26	7.29	7.29	22.34
(403.5cm.)	0.00	0.00	0.09	0.40	1.14	5.29	26.17	43.66	54.83	63.09	70.37	77.66	
- 4355	0.00	0.06	0.18	0.27	0.51	4.08	18.59	18.59	11.74	8.32	7.83	7.34	22.50
(423.5cm.)	0.00	0.06	0.24	0.51	1.02	5.10	23.69	42.28	54.02	62.33	70.16	77.50	
- 4356	0.00	0.05	0.13	0.31	0.70	4.64	24.88	18.05	11.22	7.81	6.34	6.83	19.03
(443.5cm.)	0.00	0.05	0.18	0.49	1.20	5.84	30.72	48.77	59.99	67.80	74.14	80.97	
- 4357	0.00	0.06	0.18	0.29	0.73	2.49	14.66	16.12	14.17	9.77	9.28	7.82	24.43
(466.5cm.)	0.00	0.06	0.23	0.53	1.26	3.76	18.41	34.53	48.70	58.47	67.76	75.57	
- 4358	0.00	0.33	0.39	0.66	1.27	5.94	20.84	15.63	10.42	9.00	6.63	7.10	21.79
(483.5cm.)	0.00	0.33	0.72	1.39	2.65	8.59	29.43	45.06	55.48	64.48	71.11	78.21	
- 4359	0.00	0.22	0.28	0.41	1.03	6.74	21.04	14.34	11.48	8.61	7.17	7.17	21.52
(505.5cm.)	0.00	0.22	0.50	0.90	1.93	8.67	29.71	44.05	55.53	64.14	71.31	78.48	
- 4360	0.00	0.03	0.15	0.25	0.74	5.85	18.40	14.53	12.59	9.20	7.75	7.26	23.24
(523.5cm.)	0.00	0.03	0.19	0.43	1.17	7.03	25.43	39.95	52.54	61.75	69.49	76.76	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4353	2.78	61.71	35.51	CLAYEY SILT	0.58	7.59	2.84	0.62	2.12	-0.57
- 4354	1.14	53.69	45.17	CLAYEY SILT	0.84	8.30	2.77	0.38	1.81	-0.58
- 4355	1.02	53.00	45.98	CLAYEY SILT	0.87	8.36	2.75	0.34	1.85	-0.54
- 4356	1.20	58.80	40.01	CLAYEY SILT	0.68	7.99	2.72	0.54	2.03	-0.56
- 4357	1.26	47.44	51.30	SILTY CLAY	1.08	8.65	2.70	0.19	1.86	-0.49
- 4358	2.65	52.83	44.52	CLAYEY SILT	0.84	8.14	2.88	0.28	1.99	-0.45
- 4359	1.93	53.60	44.47	CLAYEY SILT	0.83	8.16	2.85	0.31	1.93	-0.49
- 4360	1.17	51.37	47.46	CLAYEY SILT	0.92	8.38	2.80	0.28	1.80	-0.55

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4353	26.59	0.00	0.00	0.00	0.00	0.00	0.00	2.78	61.71	35.51
- 4354	28.30	0.00	0.00	0.00	0.00	0.00	0.00	1.14	53.69	45.17
- 4355	26.45	0.04	0.00	0.00	0.04	0.00	0.04	1.02	52.98	45.96
- 4356	26.18	0.00	0.00	0.00	0.00	0.00	0.00	1.20	58.80	40.01
- 4357	27.05	0.92	0.00	0.92	0.00	0.92	0.00	1.25	47.00	50.82
- 4358	28.14	0.57	0.00	0.00	0.57	0.00	0.57	2.64	52.53	44.27
- 4359	27.91	0.18	0.00	0.00	0.18	0.00	0.18	1.93	53.50	44.39
- 4360	28.05	0.00	0.00	0.00	0.00	0.00	0.00	1.17	51.37	47.46

TABLE 15-3-B (cont.)

GRAIN SIZE ANALYSIS HU82-031-SU5

<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCENT

[Size Separates Expressed In Microns]

LABORATORY	2000	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	<
NUMBER	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	0.49	0.49
GRL - 4361	0.00	0.00	0.12	0.30	0.91	4.06	14.56	15.53	13.59	9.22	8.25	7.76	25.72
(543.5cm.)	0.00	0.00	0.12	0.42	1.33	5.38	19.94	35.47	49.05	58.27	66.52	74.28	
- 4362	0.00	0.06	0.12	2.55	6.19	15.29	20.52	11.72	8.37	6.28	4.19	4.61	20.10
(565.0cm.)	0.00	0.06	0.18	2.73	8.93	24.21	44.73	56.45	64.83	71.11	75.30	79.90	
- 4401	0.00	0.00	0.18	2.66	18.05	50.55	17.14	2.62	1.19	0.71	1.19	0.71	5.00
(571.0cm.)	0.00	0.00	0.18	2.84	20.89	71.44	88.58	91.19	92.38	93.10	94.29	95.00	
- 4363	0.00	0.03	0.15	1.09	3.87	10.35	17.98	13.94	9.89	7.19	6.29	5.39	23.83
(584.0cm.)	0.00	0.03	0.18	1.27	5.13	15.48	33.46	47.40	57.29	64.48	70.78	76.17	
- 4364	0.00	0.00	0.34	3.29	15.07	22.91	14.43	8.73	7.05	4.70	4.36	3.69	15.44
(597.5cm.)	0.00	0.00	0.34	3.63	18.70	41.61	56.04	64.76	71.81	76.51	80.87	84.56	
- 4402	0.00	0.14	0.29	8.47	12.01	11.73	16.02	10.92	8.37	6.19	5.10	4.73	16.02
(609.0cm.)	0.00	0.14	0.43	8.90	20.91	32.64	48.66	59.58	67.96	74.15	79.25	83.98	
- 4403	0.00	0.05	0.23	2.49	10.90	17.28	23.40	10.36	6.91	5.37	4.60	4.99	13.43
(613.0cm.)	0.00	0.05	0.28	2.77	13.67	30.94	54.34	64.70	71.61	76.98	81.58	86.57	
- 4365	0.00	0.22	0.22	0.35	1.23	7.01	16.67	16.67	12.38	8.10	7.14	6.19	23.81
(622.0cm.)	0.00	0.22	0.44	0.79	2.02	9.03	25.70	42.37	54.75	62.85	70.00	76.19	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4361	1.33	47.72	50.95	SILTY CLAY	1.07	8.65	2.77	0.17	1.75	-0.54
- 4362	8.93	55.90	35.17	CLAYEY SILT	0.63	7.42	3.13	0.52	1.98	-0.57
- 4401	20.89	71.50	7.62	SANDY SILT	0.11	5.05	2.07	2.53	9.35	-0.52
- 4363	5.13	52.16	42.71	CLAYEY SILT	0.82	8.02	3.06	0.31	1.78	-0.57
- 4364	18.70	53.11	28.19	CLAYEY SILT	0.53	6.67	3.15	0.78	2.32	-0.60
- 4402	20.91	47.05	32.04	SAND-SILT-CLAY	0.68	6.89	3.23	0.51	2.11	-0.50
- 4403	13.67	57.94	28.39	CLAYEY SILT	0.49	6.80	2.95	0.78	2.47	-0.52
- 4365	2.02	52.73	45.25	CLAYEY SILT	0.86	8.29	2.88	0.27	1.88	-0.50

TOTAL MATERIAL DATA [Size Seoarates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4361	28.08	0.00	0.00	0.00	0.00	0.00	0.00	1.33	47.72	50.95
- 4362	27.58	0.00	0.00	0.00	0.00	0.00	0.00	8.93	55.90	35.17
- 4401	4.84	0.00	0.00	0.00	0.00	0.00	0.00	20.89	71.50	7.62
- 4363	29.31	0.31	0.00	0.24	0.07	0.24	0.07	5.12	52.00	42.58
- 4364	28.95	0.00	0.00	0.00	0.00	0.00	0.00	18.70	53.11	28.19
- 4402	4.24	0.00	0.00	0.00	0.00	0.00	0.00	20.91	47.05	32.04
- 4403	4.36	0.00	0.00	0.00	0.00	0.00	0.00	13.67	57.94	28.39
- 4365	28.34	0.56	0.00	0.32	0.25	0.32	0.25	2.01	52.43	44.99

TABLE 15-3-B (cont.)
GRAIN SIZE ANALYSIS HU82-031-SU5
<2000u. MINERAL MATERIAL SIZE DISTRIBUTION - PER FRACTION AND CUMULATIVE PERCEN

[Size Separates Expressed In Microns]

LABORATORY	2000	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	<
NUMBER	1000	500	250	125	63	31.2	15.6	7.8	3.9	1.95	0.98	0.49	0.49
GRL - 4366	0.00	0.03	0.27	0.43	0.70	1.80	7.33	13.20	11.73	10.26	8.31	9.29	36.65
(653.5cm.)	0.00	0.03	0.30	0.73	1.43	3.23	10.56	23.76	35.49	45.75	54.06	63.35	
- 4295	0.00	0.33	0.44	0.87	1.06	3.28	8.20	9.64	13.98	10.13	7.71	10.13	34.23
(672.0cm.)	0.00	0.33	0.76	1.64	2.69	5.98	14.17	23.82	37.80	47.93	55.64	65.77	
- 4367	3.15	2.71	4.39	5.54	4.17	4.62	8.55	9.72	9.72	8.16	6.22	7.00	26.05
(690.0cm.)	3.15	5.86	10.25	15.79	19.96	24.58	33.13	42.85	52.57	60.73	66.96	73.95	
- 4368	0.07	0.13	0.26	0.46	0.59	2.03	5.88	12.73	12.73	9.30	8.32	8.81	38.68
(710.0cm.)	0.07	0.20	0.46	0.92	1.51	3.53	9.41	22.14	34.87	44.18	52.50	61.32	
- 4369	0.06	0.39	0.66	1.31	1.94	4.87	9.83	12.63	11.70	8.89	7.02	7.96	32.76
(725.0cm.)	0.06	0.45	1.10	2.42	4.35	9.22	19.05	31.68	43.38	52.27	59.29	67.24	
- 4370	0.00	0.12	0.49	0.97	2.10	6.07	9.82	12.63	12.63	8.88	7.01	7.48	31.80
(745.0cm.)	0.00	0.12	0.61	1.58	3.68	9.75	19.57	32.20	44.82	53.71	60.72	68.20	
- 4371	0.00	0.15	0.66	2.27	3.44	7.12	12.21	14.02	11.76	8.14	6.78	6.78	26.68
(763.5cm.)	0.00	0.15	0.81	3.08	6.51	13.63	25.84	39.86	51.62	59.75	66.54	73.32	

LABORATORY NUMBER	% SAND	% SILT	% CLAY	TEXTURAL CLASSIFICATION	CL/SI RATIO	PHI MEAN	PHI SORT	SKEW	KURT	DELTA VAR
GRL - 4366	1.43	34.06	64.51	SILTY CLAY	1.89	9.48	2.74	-0.28	1.89	-0.50
- 4295	2.69	35.ii	62.20	SILTY CLAY	1.77	9.28	2.87	-0.36	2.17	-0.40
- 4367	19.96	32.62	47.43	SILTY CLAY	1.45	7.66	3.93	-0.32	2.06	-0.43
- 4368	1.51	33.37	65.13	SILTY CLAY	1.95	9.58	2.76	-0.38	2.08	-0.45
- 4369	4.35	39.03	56.62	SILTY CLAY	1.45	8.92	3.07	-0.25	2.01	-0.43
- 4370	3.68	41.14	55.18	SILTY CLAY	1.34	8.87	3.01	-0.14	1.84	-0.49
- 4371	6.51	45.10	48.38	SILTY CLAY	1.07	8.36	3.11	0.02	1.87	-0.47

TOTAL MATERIAL DATA [Size Separates In mm.]

LABORATORY NUMBER	SAMPLE WT (g)	% >2	% 16-8	% 8-4	% 4-2	% PEBBLE	% GRAN	% SAND	% SILT	% CLAY
GRL - 4366	24.25	0.12	0.00	0.00	0.12	0.00	0.12	1.43	34.01	64.43
- 4295	190.54	0.26	0.00	0.00	0.26	0.00	0.26	2.69	35.02	62.04
- 4367	29.03	7.37	0.00	5.17	2.20	5.17	2.20	18.48	30.21	43.93
- 4368	26.72	0.11	0.00	0.00	0.11	0.00	0.11	1.51	33.33	65.05
- 4369	26.89	3.50	0.00	2.16	1.34	2.16	1.34	4.20	37.66	54.64
- 4370	27.67	0.00	0.00	0.00	0.00	0.00	0.00	3.68	41.14	55.18
- 4371	31.69	0.00	0.00	0.00	0.00	0.00	0.00	6.51	45.10	48.38

TABLE 15-3-C

Liquidity Index HU82-031- C15

SAMPLE NUMBER	% WATER CONTENT	PLASTIC LIMIT	PLASTICITY INDEX	LIQUIDITY INDEX
GRL - 4301	24.92	23.03	3.25	58.15
- 4302	43.08	26.13	10.25	165.37
- 4304	66.01	22.50	29.97	145.18
- 4307	52.65	32.05	15.25	135.08
- 4310	55.60	22.46	27.11	122.24
- 4312	57.54	18.22	31.13	126.31
- 4315	37.29	16.25	17.41	120.85
- 4319	55.58	19.35	28.65	126.46
-				
- 4321	68.27	20.00	29.97	161.06
- 4322	64.43	19.81	29.71	150.19
- 4324	65.24	8.62	41.57	136.20
- 4326	52.10	20.33	23.43	135.60
- 4328	56.80	20.00	24.42	150.70
- 4330	47.11	19.79	18.95	144.17
- 4332	43.43	17.71	16.26	158.19
- 4334	38.80	22.18	10.37	160.27
- 4336	51.62	20.86	20.81	147.81

TABLE 15-3-D

Liquidity Index HU82-031-SU5

SAMPLE NUMBER	% WATER CONTENT	PLASTIC LIMIT	PLASTICITY INDEX	LIQUIDITY INDEX
SRL - 4338	112.36	52.01	35.16	171.64
- 4340	97.72	41.37	37.22	151.40
- 4343	76.33	43.71	18.79	173.60
- 4345	51.97	29.80	20.63	107.46
- 4346	51.17	34.43	10.73	156.01
- 4347	41.30	27.49	10.76	128.35
- 4348	38.51	23.08	10.77	143.27
- 4352	43.96	30.25	8.84	155.09
- 4355	47.08	26.20	12.98	160.86
- 4359	42.53	20.47	17.01	129.69
- 4362	34.58	20.27	5.42	264.02
- 4363	40.78	18.83	13.11	167.43
- 4364	35.13	17.95	6.36	270.13
- 4365	40.74	23.02	13.66	129.72
- 4366	63.65	36.67	16.37	164.81
- 4367	43.89	20.39	11.86	198.15
- 4368	56.18	21.06	31.40	111.85
- 4371	38.29	22.22	14.14	113.65

$$\text{Liquidity Index} = \frac{\text{Water Content} - \text{Plastic Limit}}{\text{Plasticity Index}} \times 100$$

TABLE 15-4-A
DEMAGNETIZED PALEOMAGNETIC DATA HU78-24
Blanket Demag Level = 100 oe

CASE-NO	DEPTH (cm)	DDEC	DINC	DINT (emu/cc x 10^{-6})
1	5.0	-135.0	62.0	52.2
2	10.0	-125.0	49.0	60.1
3	15.0	-96.0	55.0	60.4
4	20.0	-142.0	76.0	48.1
5	25.0	-87.0	68.0	53.2
6	30.0	-53.0	84.0	69.3
7	35.0	-104.0	70.0	59.8
8	40.0	-47.0	75.0	61.4
9	45.0	108.0	67.0	47.1
10	50.0	36.0	41.0	47.5
11	55.0	79.0	24.0	62.6
12	60.0	59.0	63.0	76.8
13	65.0	25.0	64.0	90.7
14	70.0	35.0	69.0	80.7
15	75.0	55.0	63.0	71.5
16	80.0	38.0	81.0	78.9
17	85.0	-40.0	66.0	84.6
18	90.0	-37.0	69.0	92.7
19	95.0	-15.0	71.0	80.4
20	100.0	-35.0	72.0	66.4
21	105.0	-15.0	87.0	98.0
22	110.0	41.0	82.0	80.2
23	115.0	-59.0	80.0	99.4
24	120.0	-58.0	79.0	106.9
25	125.0	-63.0	73.0	108.4
26	130.0	-53.0	77.0	100.3
27	135.0	-40.0	68.0	109.3
28	140.0	-93.0	64.0	122.5
29	145.0	-85.0	66.0	108.6
30	150.0	-102.0	72.0	98.0
31	155.0	-88.0	73.0	101.7
32	160.0	-88.0	66.0	118.0
33	165.0	-56.0	79.0	100.4
34	170.0	-110.0	75.0	109.2
35	175.0	-102.0	68.0	107.2
36	180.0	-103.0	72.0	117.5
37	185.0	-95.0	62.0	107.5
38	190.0	-126.0	60.0	120.4
39	195.0	-91.0	97.0	103.0
40	200.0	-97.0	63.0	125.5
41	205.0	-104.0	59.0	124.3
42	210.0	-101.0	67.0	139.4
43	215.0	-80.0	65.0	114.6
44	220.0	-97.0	65.0	113.9
45	225.0	-82.0	64.0	100.0
46	230.0	-109.0	73.0	96.3
47	235.0	-167.0	-59.0	70.7
48	240.0	-164.0	-68.0	81.1
49	245.0	32.0	64.0	81.4
50	255.0	57.0	71.0	100.0

TABLE 15-4-A (cont.)

DEMAGNETIZED PALEOMAGNETIC DATA HU38-24

CASE-NO	DEPTH	DDEC	DINC	DINT
51	260.0	87.0	72.0	135.8
52	265.0	69.0	71.0	145.8
53	285.0	110.0	79.0	108.2
54	290.0	155.0	75.0	166.4
55	305.0	111.0	67.0	182.7
56	310.0	125.0	73.0	173.6
57	315.0	83.0	83.0	169.7
58	320.0	141.0	78.0	220.4
59	325.0	92.0	74.0	218.0
60	330.0	118.0	61.0	245.2
61	335.0	137.0	79.0	221.1
62	345.0	121.0	69.0	177.0
63	350.0	124.0	58.0	314.0
64	355.0	117.0	73.0	235.9
65	360.0	114.0	65.0	231.1
66	365.0	103.0	66.0	238.9
67	370.0	116.0	68.0	243.6
68	375.0	98.0	74.0	162.7
69	380.0	97.0	68.0	159.5
70	385.0	102.0	53.0	93.6
71	390.0	143.0	47.0	102.2
72	395.0	172.0	40.0	145.0
73	400.0	154.0	44.0	112.4
74	410.0	156.0	61.0	78.3
75	425.0	55.0	77.0	79.7
76	430.0	103.0	77.0	148.4
77	435.0	82.0	66.0	116.9
78	440.0	75.0	76.0	115.8
79	445.0	75.0	72.0	120.4
80	450.0	75.0	56.0	111.3
81	455.0	101.0	77.0	134.2
82	460.0	97.0	71.0	131.9
83	465.0	128.0	78.0	150.6
84	470.0	105.0	72.0	183.7
85	475.0	145.0	80.0	211.3
86	480.0	106.0	77.0	192.4
87	485.0	131.0	72.0	223.2
88	490.0	110.0	73.0	268.6
89	495.0	133.0	70.0	235.2
90	500.0	107.0	69.0	249.4
91	505.0	121.0	71.0	313.1
92	510.0	116.0	62.0	225.9
93	515.0	130.0	62.0	236.3
94	520.0	118.0	84.0	196.6
95	545.0	159.0	72.0	61.0
96	550.0	173.0	77.0	137.3
97	555.0	68.0	85.0	74.8
98	560.0	4.0	78.0	120.9
99	565.0	95.0	83.0	86.0
100	570.0	8.0	81.0	83.6
101	583.0	121.0	76.0	216.4

TABLE 15-4-B
DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-CL5

Blanket Demag Level = 150 oe

CASE-NO	DEPTH	DDEC	DINC	DINT (emu/cc x 10^{-6})
1	11.0	-141.0	-51.0	31.2
2	24.0	-119.0	-56.0	76.4
3	26.0	-151.0	-39.0	81.6
4	31.0	180.0	-58.0	108.2
5	36.0	166.0	40.0	122.1
6	41.0	174.0	-32.0	95.3
7	46.0	-167.0	-46.0	69.5
8	51.0	-157.0	-55.0	157.5
9	56.0	-173.0	-26.0	115.2
10	61.0	-168.0	29.0	103.9
11	66.0	-158.0	-14.0	148.9
12	71.0	-162.0	-23.0	60.0
13	78.0	-162.0	-47.0	44.0
14	85.0	57.0	71.0	51.0
15	90.0	-48.0	63.0	52.7
16	95.0	73.0	62.0	65.7
17	103.0	11.0	85.0	48.7
18	110.0	119.0	80.0	64.8
19	115.0	18.0	67.0	52.4
20	120.0	56.0	73.0	61.0
21	130.0	-15.0	71.0	70.9
22	135.0	36.0	79.0	54.1
23	140.0	123.0	82.0	69.5
24	145.0	143.0	85.0	75.9
25	148.0	107.0	78.0	65.4
26	150.0	123.0	61.0	102.8
27	156.0	44.0	74.0	44.1
28	162.0	-176.0	35.0	12.0
29	167.0	77.0	57.0	66.0
30	175.0	76.0	86.0	85.1
31	180.0	51.0	73.0	117.1
32	185.0	58.0	62.0	116.6
33	195.0	37.0	65.0	110.3
34	205.0	133.0	67.0	109.2
35	210.0	45.0	84.0	62.9
36	215.0	-24.0	55.0	63.4
37	220.0	43.0	80.0	74.5
38	225.0	-90.0	88.0	103.5
39	240.0	68.0	88.0	134.7
40	245.0	-149.0	65.0	132.9
41	250.0	-156.0	71.0	173.9
42	255.0	-158.0	71.0	134.2
43	260.0	-160.0	53.0	98.8
44	265.0	-171.0	63.0	180.9
45	270.0	-165.0	68.0	181.2
46	275.0	175.0	68.0	251.1
47	280.0	-179.0	67.0	170.1
48	285.0	179.0	71.0	255.5
49	290.0	176.0	73.0	237.6
50	297.0	165.0	73.0	258.8

TABLE 15-4-B (cont.)
DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-CL5

CASE-NO	DEPTH	DDEC	DINC	DINT
51	303.0	155.0	54.0	151.9
52	306.0	-176.0	78.0	209.9
53	315.0	126.0	75.0	139.2
54	320.0	144.0	64.0	70.4
55	325.0	153.0	60.0	101.7
56	330.0	135.0	57.0	92.2
57	335.0	-162.0	43.0	74.6
58	340.0	-171.0	52.0	81.6
59	350.0	-171.0	42.0	72.6
60	355.0	-167.0	35.0	106.0
61	360.0	170.0	43.0	118.5
62	365.0	179.0	46.0	115.0
63	370.0	170.0	37.0	124.1
64	375.0	177.0	38.0	124.2
65	380.0	177.0	39.0	108.6
66	385.0	177.0	36.0	125.3
67	390.0	-161.0	40.0	119.8
68	395.0	-44.0	49.0	106.4
69	400.0	-79.0	50.0	109.6
70	415.0	-41.0	66.0	97.9
71	420.0	-141.0	81.0	90.9
72	425.0	-131.0	76.0	110.0
73	430.0	-170.0	73.0	90.7
74	435.0	-57.0	64.0	122.5
75	440.0	132.0	55.0	93.6
76	450.0	169.0	65.0	94.8
77	470.0	-131.0	65.0	94.8
78	480.0	-131.0	56.0	96.7
79	490.0	-154.0	57.0	100.6
80	500.0	45.0	54.0	95.7
81	510.0	53.0	57.0	98.0
82	520.0	76.0	51.0	112.9
83	530.0	61.0	52.0	111.9
84	540.0	81.0	39.0	125.9
85	550.0	66.0	35.0	136.1
86	560.0	-147.0	29.0	153.7
87	570.0	-155.0	28.0	154.0
88	580.0	-142.0	36.0	132.6
89	590.0	-139.0	35.0	145.6
90	600.0	-135.0	31.0	143.6
91	610.0	-129.0	37.0	139.1
92	620.0	-122.0	35.0	136.4
93	630.0	-128.0	30.0	136.5
94	640.0	-124.0	29.0	139.3
95	650.0	-111.0	21.0	143.4
96	660.0	-88.0	42.0	124.3
97	670.0	-94.0	38.0	126.5
98	680.0	-64.0	49.0	112.7
99	690.0	-68.0	46.0	128.8
100	700.0	171.0	67.0	71.5

TABLE 15-4-B (cont.)
DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-CL5

CASE-NO	DEPTH	DDEC	DINC	DINT
101	710.0	-94.0	-39.0	115.0
102	720.0	16.0	-13.0	72.4
103	730.0	-2.0	-11.0	73.9
104	740.0	-93.0	-24.0	81.0
105	750.0	-92.0	-16.0	155.1
106	760.0	-50.0	-64.0	86.3
107	770.0	-98.0	-28.0	128.5
108	780.0	-42.0	47.0	52.6
109	790.0	-146.0	16.0	35.3
110	800.0	-107.0	7.0	67.8
111	810.0	-150.0	23.0	65.9
112	820.0	124.0	59.0	48.9
113	830.0	-146.0	10.0	63.9
114	840.0	147.0	78.0	72.8
115	850.0	-38.0	63.0	112.9
116	860.0	-51.0	71.0	114.2
117	870.0	2.0	33.0	96.8
118	880.0	-90.0	20.0	135.7
119	890.0	-29.0	-6.0	75.2
120	900.0	-146.0	10.0	112.9
121	910.0	-175.0	21.0	52.2
122	920.0	-162.0	46.0	88.6
123	930.0	-127.0	-10.0	98.3
124	940.0	-42.0	-53.0	74.9
125	950.0	-164.0	-20.0	46.4
126	960.0	147.0	24.0	64.1
127	980.0	-135.0	55.0	48.7

TABLE 15-4-C
DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-TI3

CASE-NO	DEPTH (cm)	DDEC	DINC	DINT (emu/cc x 10^{-6})	SUSCEP (emu/cc x10^{-4})
1	10.0	174.0	80.0	35.2	.4
2	15.0	258.0	67.0	33.1	.4
3	20.0	268.0	80.0	30.8	.4
4	25.0	250.0	69.0	34.8	.4
5	30.0	267.0	79.0	29.6	.4
6	35.0	269.0	73.0	38.2	.4
7	40.0	255.0	81.0	33.9	.4
8	45.0	231.0	69.0	36.6	.4
9	50.0	222.0	75.0	43.3	.4
10	55.0	229.0	78.0	39.1	.4
11	60.0	200.0	71.0	35.0	.4
12	65.0	233.0	79.0	35.6	.4
13	70.0	190.0	73.0	45.5	.4
14	75.0	206.0	71.0	41.3	.4
15	80.0	215.0	72.0	41.2	.4
16	85.0	202.0	73.0	43.9	.4
17	90.0	197.0	68.0	47.3	.4
18	95.0	203.0	72.0	46.2	.4
19	98.0	218.0	67.0	29.8	.4
20	105.0	196.0	74.0	48.0	.4
21	110.0	201.0	71.0	44.3	.5
22	115.0	228.0	76.0	49.8	.4
23	120.0	207.0	74.0	42.2	.4
24	125.0	217.0	81.0	40.6	.4
25	130.0	185.0	69.0	29.1	.5
26	135.0	214.0	64.0	37.7	.4
27	140.0	182.0	74.0	38.4	.4
28	145.0	215.0	79.0	36.7	.4
29	150.0	179.0	83.0	33.7	.4
30	155.0	183.0	76.0	34.4	.4
31	160.0	155.0	75.0	24.3	.4
32	165.0	238.0	82.0	37.5	.4
33	170.0	248.0	87.0	37.3	.4
34	175.0	203.0	78.0	40.9	.5
35	180.0	248.0	83.0	49.6	.4
36	185.0	233.0	79.0	47.7	.4
37	190.0	235.0	84.0	47.8	.4
38	195.0	221.0	76.0	56.0	.4
39	200.0	249.0	81.0	48.3	.4
40	205.0	212.0	75.0	30.7	.4
41	210.0	123.0	83.0	31.4	.4
42	215.0	164.0	68.0	37.8	.4
43	220.0	147.0	71.0	31.4	.4
44	225.0	132.0	75.0	42.9	.4
45	230.0	158.0	66.0	21.3	.4

TABLE 15-4-C (cont.)
DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-TI3

CASE-NO	DEPTH	DDEC	DINC	DINT	SUSCEP
46	235.0	185.0	66.0	22.7	.4
47	240.0	162.0	71.0	28.5	.4
48	245.0	98.0	77.0	39.7	.4
49	250.0	141.0	72.0	44.5	.4
50	255.0	150.0	77.0	43.3	.4
51	260.0	120.0	78.0	34.5	.4
52	265.0	158.0	80.0	29.2	.3
53	270.0	140.0	79.0	32.9	.4
54	275.0	143.0	70.0	33.3	.4
55	280.0	147.0	72.0	31.6	.4
56	285.0	185.0	82.0	41.2	.4
57	290.0	138.0	70.0	37.1	.6
58	295.0	178.0	55.0	24.6	.3
59	300.0	148.0	70.0	36.9	.4
60	305.0	165.0	74.0	45.1	.5
61	310.0	142.0	74.0	42.4	.5
62	315.0	169.0	77.0	34.4	.4
63	320.0	114.0	80.0	27.4	.5
64	330.0	143.0	82.0	37.1	.5
65	335.0	143.0	79.0	43.4	.5
66	340.0	150.0	80.0	44.8	.5
67	345.0	159.0	81.0	46.2	.5
68	350.0	158.0	83.0	51.3	.5
69	355.0	194.0	67.0	40.2	.6
70	363.0	5.0	76.0	51.8	.5
71	372.0	343.0	81.0	50.5	.5
72	380.0	34.0	82.0	31.8	.4
73	385.0	324.0	61.0	104.3	.6
74	390.0	3.0	73.0	38.9	.5
75	395.0	329.0	79.0	56.8	.6
76	400.0	347.0	72.0	15.6	.3
77	405.0	345.0	67.0	12.8	.3
78	410.0	319.0	57.0	83.7	.3
79	415.0	318.0	80.0	42.8	.6
80	420.0	14.0	67.0	38.3	.3
81	425.0	36.0	68.0	57.0	.2
82	430.0	12.0	32.0	75.3	.2
83	435.0	-0	-0	-0	.4
84	440.0	300.0	64.0	40.6	.3
85	445.0	300.0	82.0	64.7	.6
86	450.0	313.0	88.0	52.6	.5
87	455.0	248.0	79.0	37.9	.4
88	460.0	238.0	84.0	54.9	.5
89	465.0	307.0	80.0	56.6	.5
90	470.0	258.0	82.0	50.0	.0

TABLE 15-4-C (cont.)
DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-TI3

CASE-NO	DEPTH	DDEC	DINC	DINT	SUSCEP
91	475.0	272.0	33.0	74.6	.3
92	480.0	301.0	18.0	67.7	.3
93	485.0	282.0	65.0	42.7	.3
94	490.0	205.0	65.0	22.5	.3
95	495.0	31.0	39.0	38.7	.4
96	500.0	333.0	33.0	57.6	.4
97	506.0	45.0	32.0	43.2	.4
98	520.0	142.0	74.0	36.9	.4
99	525.0	161.0	44.0	36.7	.3
100	533.0	155.0	38.0	36.7	.3
101	545.0	138.0	53.0	38.9	.3
102	550.0	72.0	42.0	38.2	.3
103	555.0	81.0	41.0	32.1	.3
104	560.0	93.0	43.0	38.8	.3
105	570.0	299.0	78.0	25.5	.3
106	575.0	255.0	63.0	30.6	.3
107	580.0	169.0	78.0	22.0	.4
108	590.0	160.0	69.0	33.3	.3
109	595.0	157.0	66.0	39.7	.3
110	600.0	185.0	75.0	55.7	.4
111	605.0	206.0	54.0	40.7	.4
112	610.0	211.0	69.0	39.6	.4
113	615.0	121.0	78.0	57.1	.4
114	620.0	75.0	79.0	39.0	.4
115	630.0	166.0	72.0	34.0	.4
116	635.0	182.0	80.0	30.4	.4
117	640.0	236.0	84.0	25.5	.4
118	645.0	242.0	70.0	22.1	.4
119	650.0	316.0	78.0	22.4	.4
120	655.0	232.0	73.0	25.7	.4
121	660.0	313.0	62.0	18.2	.4
122	670.0	297.0	70.0	14.5	.4
123	680.0	236.0	77.0	34.3	.4
124	685.0	279.0	68.0	28.3	.4
125	690.0	251.0	69.0	27.8	.4
126	700.0	243.0	46.0	34.8	.4
127	705.0	239.0	53.0	34.8	.4
128	710.0	174.0	65.0	33.0	.4
129	715.0	172.0	69.0	53.3	.4
130	720.0	246.0	79.0	31.2	.5
131	725.0	181.0	47.0	35.1	.4
132	730.0	316.0	44.0	40.4	.5
133	735.0	250.0	36.0	36.0	.4
134	740.0	307.0	16.0	27.4	.5
135	745.0	251.0	40.0	83.4	.4
136	750.0	184.0	30.0	92.5	.4
137	755.0	195.0	45.0	118.0	.4
138	760.0	218.0	55.0	114.7	.5
139	765.0	189.0	53.0	110.5	.5

TABLE 15-4-C (cont.)

DEMAGNETIZED PALEOMAGNETIC DATA HU82-031-TI3

CASE-NO	DEPTH	DDEC	DINC	DINT	SUSCEP
140	770.0	216.0	72.0	118.2	.5
141	775.0	201.0	58.0	59.0	.6
142	780.0	187.0	46.0	74.2	.6
143	785.0	155.0	43.0	96.9	.7
144	790.0	32.0	61.0	23.3	.5
145	795.0	146.0	-50.0	44.9	.5
146	800.0	155.0	37.0	29.1	.6
147	805.0	159.0	88.0	44.5	.6
148	810.0	207.0	19.0	23.3	.6
149	830.0	190.0	13.0	6.2	.7
150	840.0	146.0	-59.0	42.4	.8
151	850.0	170.0	65.0	83.8	.7
152	855.0	203.0	21.0	87.2	1.0
153	860.0	186.0	51.0	93.0	1.0
154	865.0	162.0	23.0	76.7	1.0
155	870.0	197.0	35.0	50.8	1.1
156	875.0	189.0	29.0	60.9	1.1
157	880.0	196.0	42.0	47.5	.9
158	885.0	210.0	55.0	29.4	.8
159	910.0	175.0	70.0	30.9	.6
160	920.0	169.0	69.0	20.1	.5
161	925.0	243.0	35.0	15.8	.3
162	934.0	150.0	44.0	15.0	.3
163	950.0	229.0	31.0	17.0	.3
164	960.0	184.0	25.0	18.7	.3
165	965.0	157.0	44.0	31.9	.3
166	970.0	218.0	67.0	16.5	.3
167	980.0	347.0	56.0	17.2	.3
168	985.0	293.0	59.0	10.6	.3
169	990.0	292.0	63.0	13.3	.3
170	995.0	247.0	21.0	12.0	.3
171	1000.0	140.0	40.0	13.9	.3
172	1005.0	281.0	27.0	9.0	.3
173	1010.0	341.0	28.0	13.0	.3
174	1015.0	220.0	59.0	22.6	.3
175	1020.0	254.0	64.0	26.6	.3
176	1025.0	260.0	24.0	25.3	.3
177	1030.0	244.0	34.0	25.2	.4
178	1040.0	246.0	51.0	12.9	.3
179	1045.0	224.0	61.0	14.8	.3
180	1050.0	143.0	63.0	20.2	.3
181	1055.0	290.0	15.0	22.4	.3
182	1060.0	288.0	28.0	13.8	.3
183	1065.0	339.0	17.0	10.0	.3
184	1070.0	300.0	16.0	6.4	.3
185	1075.0	308.0	48.0	7.8	.3
186	1080.0	309.0	47.0	27.6	.3
187	1090.0	311.0	4.0	30.9	.3
188	1100.0	16.0	13.0	24.4	.3

TABLE 15-4-D

PALEOMAGNETIC DATA (NRM) HU82-031-SU5

'DEPTH CM'	DECL	INCL	'INTEN E-6'	'SUSC E-4'	'WETDEN G CC'
9	320	52	5.2	.73	1.505
13	180	45	5.2	.68	1.511
21	153	36	5.29	.73	1.514
31	173	61	5.98	.68	1.449
36	187	57	4.69	.68	1.361
53	174	50	6.99	.83	1.54
58	145	53	3.61	.83	1.525
71	160	57	6.28	.78	1.513
75	175	53	4.72	.83	1.509
79	192	54	7.2	.78	1.529
91	177	48	6.55	.89	1.531
96	150	48	5.38	.83	1.466
108	342	44	5.5	1.09	1.541
114	134	64	6.66	1.2	1.662
118	121	61	7.62	1.28	1.62
135	145	65	3.1	.83	1.422
150	130	57	2.56	1.07	1.385
155	134	28	2.33	1.09	1.522
171	136	27	2.5	1.38	1.701
176	139	26	2.67	1.33	1.736
191	172	24	3.83	.51	1.835
195	6	26	2.2	1.35	1.696
199	144	36	1.66	1.43	1.753
209	212	69	1.26	1.93	1.9
214	174	48	1.1	1.93	1.901
219	134	46	1.01	1.8	1.852
230	96	57	1.46	1.64	1.808
235	57	82	1.95	1.81	1.879
239	53	78	1.51	1.98	1.895
250	137	45	2.35	1.74	1.866
255	34	48	2.77	1.82	1.861
259	96	66	4.26	2.01	1.899
270	127	74	3.07	1.64	1.771
274	96	76	4.82	1.74	1.814
281	112	83	6.05	1.85	1.852
299	129	81	8.35	1.75	1.837
304	200	73	9.21	1.77	1.826
308	155	77	5.96	1.72	1.821
313	204	78	7.14	1.74	1.836
364	203	59	12.45	1.69	1.859
380	203	71	14.22	1.8	1.792

TABLE 15-4-D (cont.)

PALEOMAGNETIC DATA (NRM) HU82-031-SU 5

'DEPTH CM'	DECL	INCL	'INTEN E-3'	'SUSC E-4'	'WETDEN G CC'
384	211	71	10.95	1.72	1.77
395	262	81	9.92	1.91	1.813
398	223	65	15.01	1.95	1.789
412	73	77	16.5	1.98	1.809
419	248	77	18.03	1.82	1.789
433	228	69	12.58	1.93	1.787
440	247	82	17.54	1.87	1.756
450	309	69	13.45	1.54	1.541
454	290	78	13.43	1.61	1.741
459	298	61	6.61	1.67	1.738
476	152	72	15.99	1.98	1.784
491	153	65	14.03	2.13	1.88
498	190	56	11.5	2.11	1.84
513	320	64	14.1	2.16	1.839
518	133	70	18.34	2.11	1.799
532	155	23	2.65	2.21	1.842
537	163	70	13.84	1.95	1.855
550	144	61	15.15	1.99	1.843
557	162	68	14.4	2.08	1.833
577	178	71	22.24	2.63	1.761
589	321	43	22.01	2.99	2.013
603	34	42	1.32	1.61	1.535
630	179	61	19.88	1.95	1.776
639	191	68	21.2	1.95	1.723
647	201	62	14.56	1.64	1.672
703	74	72	4.21	1.69	1.754
718	178	78	16.89	1.67	1.767
732	59	86	16.58	1.93	1.846
738	189	84	9.86	1.07	1.85
750	155	73	11.04	2.13	1.878
756	194	79	11.68	2.37	1.914
768	195	48	11.5	2.61	1.955

TABLE 15-4-E

PALEOMAGNETIC DATA (NRM) HU 83-028- CA 4.1

'DEPTH CM'	DECL	INCL	'INTEN E-3'	'SUSC E-4'	'WETDEN G CC'
3	189	24	.457	1.3	1.3619
8	204	24	.707	1.17	1.50667
13	209	54	.474	1.04	1.3619
18	218	71	.595	1.2	1.46857
24	220	73	.454	.96	1.49556
29	-6	83	.591	.93	1.43397
34	253	79	.675	.44	1.45079
39	227	78	.673	1.15	1.33175
44	221	77	.576	.94	1.39016
49	215	81	.871	1.06	1.55206
54	192	85	.823	1.01	1.5473
59	209	86	.533	1.06	1.42222
69	179	62	.561	1.04	1.49175
74	234	64	.229	.79	1.41429
79	222	77	.423	1.09	1.52508
64	209	73	.551	1.04	1.53556
84	235	81	.499	.79	1.42127
89	218	66	.599	.82	1.48762
94	225	70	.492	.91	1.55683
98	232	62	.445	.94	1.5254
102	233	74	.983	.72	1.47651
107	216	65	.983	.69	1.49016
112	210	68	1.012	.91	1.54127
117	260	85	.761	.88	1.53206
122	227	70	.798	.75	1.48794
127	231	73	.654	.79	1.45079
132	215	65	.683	.79	1.45079
137	263	76	.676	.67	1.43397
142	259	76	.771	.74	1.53524
145	259	79	.539	.73	1.51429
152	204	56	1.152	.39	1.53746
157	245	81	.731	1.43	1.82476
162	217	83	.755	.74	1.49429
167	226	81	.568	.75	1.57746
172	228	75	.591	.69	1.39302
177	256	80	.626	.57	1.45778
182	231	83	.631	.56	1.35841
187	217	70	.645	.73	1.52508
192	201	64	.473	.89	1.5327
197	182	46	.499	1.25	1.57492
206	-85	56	.366	1.02	1.55175
211	242	25	1.097	2.13	1.74127
217	246	39	.564	2.5	1.72349
222	249	43	.226	3.31	1.64603
227	239	64	.902	2.16	1.72762

TABLE 15-4-E (cont.)

PALEOMAGNETIC DATA (NRM) HU 82-028 CA4.1

'DEPTH CM'	DECL	INCL	'INTEN E-3'	'SUSC E-4'	'WETDEN G CC'
402	166	45	.864	2.19	1.64889
407	157	59	.542	3.33	1.85651
412	120	52	1.101	2.13	1.74
417	86	72	.868	2.13	1.81111
422	139	50	.857	2.19	1.84667
426	162	53	.707	2.19	1.80984
432	184	27	4.58	2.86	1.87333
443	220	63	.476	2.29	1.80921
452	180	40	.749	2.24	1.81429
458	169	61	.249	2.97	1.80921
462	153	53	.779	9.51	1.89683
468	179	27	.554	2.91	1.93365
472	120	63	.261	2.71	1.75079
477	70	81	1.114	2.29	1.72064
482	88	77	1.012	2.08	1.75365
487	186	74	.793	1.61	1.75429
492	174	33	.196	4.32	1.89333

TABLE 15-4-E (cont.)

PALEOMAGNETIC DATA (NRM) HU83-028 CA4.1

'DEPTH CM'	DECL	INCL	'INTEN E-3'	'SUSC E-4'	'WETDEN G CC'
232	259	70	.891	2.19	1.74794
237	-73	62	1.168	2.39	1.76317
243	-89	64	.746	2.34	1.73048
247	-84	69	.237	2.34	1.82921
252	-73	59	1.153	2.26	1.87746
258	-84	48	.999	2.65	1.8146
262	-67	45	.961	1.46	1.67841
267	-42	46	1.039	1.33	1.5927
272	-42	61	.113	1.32	1.6654
277	257	76	.997	1.41	1.62032
282	-77	65	.913	1.35	1.61079
287	-44	71	.935	1.62	1.68635
292	-47	60	1.257	1.67	1.69143
297	-21	77	.903	1.82	1.77016
302	-52	74	1.111	1.72	1.70698
307	-89	51	1.026	2.03	1.73841
312	-69	67	.609	2.03	1.75429
317	4	56	1.239	1.41	1.64349
322	266	74	.998	1.72	1.6527
327	-39	71	.934	1.61	1.67365
332	22	81	.935	1.91	1.72508
337	115	89	1.013	1.82	1.67968
347	201	43	.937	1.98	1.74952
352	173	65	.497	2.61	1.9146
358	161	63	.432	1.56	1.64
362	107	68	.818	1.67	1.72508
367	144	52	.499	1.51	1.5727
372	199	60	.411	3.02	1.93905
377	167	27	.671	2.55	1.80317
382	201	73	.453	2.29	1.69143
387	200	47	.222	3.23	1.73683
392	200	31	.396	3.85	1.87587
397	142	47	.511	3.18	1.88825

TABLE 15-5-A

SEDIMENTOLOGY LABORATORY - INSTAAR
Semiquantitative Results Of <2µm Bulk Mineralogy

HU76-26
SCOTT INLET

DEPTH (cm.)	Mineral Area Distribution - Per Mineral & Cumulative Percent										TOTAL AREA	K/C RATIO
	DOL	CAL	PLAG	KSPAR	QTZ 2	KAOL	CHLOR	AMPHI	SMECT	MICA		
17	2.95	0.00	17.53	0.00	8.04	3.97	5.27	2.67	5.46	54.11	1.17E7	0.75
	2.95	2.95	20.48	20.48	28.52	32.49	37.76	40.44	45.89	100.00		
32	4.33	0.00	16.59	0.00	8.57	1.80	6.90	1.59	8.42	51.80	1.24E7	0.26
	4.33	4.33	20.92	20.92	29.50	31.29	38.19	39.78	48.20	100.00		
47	2.25	0.00	11.81	0.00	5.44	2.45	5.07	2.21	5.87	64.91	1.18E7	0.48
	2.25	2.25	14.06	14.06	19.50	21.95	27.02	29.22	35.09	100.00		
63	4.25	2.57	13.34	7.54	6.30	2.08	5.28	2.43	0.00	56.21	1.46E7	0.39
	4.25	6.82	20.16	27.70	34.00	36.08	41.36	43.79	43.79	100.00		
77	1.86	2.05	11.73	6.07	3.85	3.07	3.82	1.72	0.00	65.82	1.36E7	0.80
	1.86	3.91	15.64	21.72	25.57	28.64	32.46	34.18	34.18	100.00		
91.5	2.32	3.03	11.59	0.00	6.13	3.67	3.42	2.86	10.19	56.79	1.56E7	1.07
	2.32	5.36	16.95	16.95	23.08	26.75	30.17	33.03	43.21	100.00		
107.5	7.49	7.66	9.88	0.00	6.65	0.00	8.42	0.00	1.52	58.38	1.37E7	0.00
	7.49	15.15	25.03	25.03	31.68	31.68	40.09	40.09	41.62	100.00		
130	0.96	0.00	10.95	8.15	4.80	1.28	8.72	2.66	0.40	62.09	1.47E7	0.15
	0.96	0.96	11.90	20.06	24.86	26.13	34.86	37.52	37.91	100.00		

Quantification Determined From Glycolated Test Using DSDP Factors.

Test Run -	37 - 4 (2 0)	Scan: 2.0	2 0/min.	Chart Speed: 2cm./min.
K/C Slow Scan -	25.25 - 24.5 (2 0)	Scan: 0.5	2 0/min.	Chart Speed: 2cm./min.

TABLE 15-5-B

SEDIMENTOLOGY LABORATORY - INSTAAR
Semiquantitative Results Of <2µm Bulk Mineralogy

HU78-24
SCOTT INLET

DEPTH (cm.)	Mineral Area Distribution - Per Mineral & Cumulative Percent										TOTAL AREA	K/C RATIO
	DOL	CAL	PLAG	KSPAR	QTZ 2	KAOL	CHLOR	AMPHI	SMECT	MICA		
11	1.30	0.00	13.02	0.00	13.17	4.70	6.91	0.00	6.56	54.33	8.08E6	0.68
	1.30	1.30	14.33	14.33	27.50	32.20	39.11	39.11	45.67	100.00		
61	1.76	0.00	10.17	6.19	4.98	2.99	6.15	1.35	16.10	50.30	1.48E7	0.49
	1.76	1.76	11.93	18.12	23.10	26.09	32.24	33.60	49.70	100.00		
101	2.80	0.00	8.20	0.00	2.97	4.65	5.53	1.47	19.25	55.13	1.58E7	0.84
	2.80	2.80	11.00	11.00	13.97	18.61	24.15	25.62	44.87	100.00		
150	5.27	0.00	17.04	0.00	7.02	16.98	-7.83	1.88	4.56	55.08	8.19E6	-2.17
	5.27	5.27	22.31	22.31	29.32	46.31	38.48	40.36	44.92	100.00		
210	2.28	0.00	9.81	8.76	6.04	4.70	4.86	1.48	6.29	55.77	1.41E7	0.97
	2.28	2.28	12.10	20.86	26.90	31.60	36.46	37.94	44.23	100.00		
250	3.34	0.00	11.88	0.00	4.71	2.98	6.10	0.00	15.57	55.43	8.09E6	0.49
	3.34	3.34	15.22	15.22	19.93	22.90	29.01	29.01	44.57	100.00		
270	1.73	0.00	10.77	0.00	3.62	4.84	7.73	1.97	4.81	64.53	1.27E7	0.63
	1.73	1.73	12.50	12.50	16.12	20.96	28.69	30.66	35.47	100.00		
310	2.66	0.00	15.07	0.00	4.23	4.15	6.37	2.57	0.00	64.94	1.03E7	0.65
	2.66	2.66	17.74	17.74	21.97	26.12	32.50	35.06	35.06	100.00		
350	0.00	0.00	14.82	8.41	5.54	2.25	5.36	3.17	2.26	58.18	1.39E7	0.42
	0.00	0.00	14.82	23.24	28.78	31.03	36.40	39.57	41.82	100.00		
390	1.76	0.00	15.50	8.16	5.54	3.33	3.59	2.03	0.00	60.09	1.43E7	0.93
	1.76	1.76	17.26	25.43	30.96	34.30	37.89	39.91	39.91	100.00		
450	2.51	0.00	10.51	0.00	7.02	4.71	6.42	3.08	0.00	65.74	1.25E7	0.73
	2.51	2.51	13.02	13.02	20.05	24.75	31.17	34.26	34.26	100.00		
510	1.40	0.00	11.65	8.17	6.92	1.76	6.34	3.35	0.00	60.39	1.46E7	0.28
	1.40	1.40	13.06	21.23	28.16	29.92	36.26	39.61	39.61	100.00		
577	0.67	0.00	13.23	0.00	3.87	1.63	3.72	2.19	0.00	74.70	1.43E7	0.44
	0.67	0.67	13.90	13.90	17.76	19.39	23.11	25.30	25.30	100.00		

Quantification Determined From Glycolated Test Using BGDP Factors.
Test Run - 37 - 4 (2 θ) Scan: 2.0 2 θ/min. Chart Speed: 2cm./min.
K/C Slow Scan - 25.25 - 24.5 (2 θ) Scan: 0.5 2 θ/min. Chart Speed: 2cm./min.

TABLE 15-5-C

SEDIMENTOLOGY LABORATORY - INSTAAR
Semiquantitative Results Of <2μm Bulk Mineralogy
HU82-CL5
CLARK FIORD

Mineral Area Distribution - Per Mineral & Cumulative Percent

LABORATORY NUMBER (DEPTH CM)	DOL	CAL	PLAG	KSPAR	QTZ 2	KAOL	CHLOR	AMPHI	SMECT	MICA	TOTAL AREA	K/C RATIO
GRL - 4301	0.00	0.00	14.30	0.00	4.17	1.87	6.82	0.00	0.00	72.84	9.00E6	0.27
(4.5)	0.00	0.00	14.30	14.30	18.47	20.34	27.16	27.16	27.16	100.00		
- 4304	0.00	0.00	12.56	6.33	5.44	1.40	6.47	3.12	2.46	62.22	1.89E7	0.22
(57)	0.00	0.00	12.56	18.90	24.34	25.74	32.21	35.33	37.78	100.00		
- 4306	1.04	0.00	13.61	7.54	3.41	3.54	4.09	3.02	2.70	61.04	1.12E7	0.87
(74.5)	1.04	1.04	14.65	22.19	25.60	29.14	33.23	36.26	38.96	100.00		
- 4309	0.00	0.00	8.60	7.19	4.61	2.79	4.45	1.80	6.76	63.80	1.42E7	0.63
(112)	0.00	0.00	8.60	15.79	20.40	23.19	27.64	29.44	36.20	100.00		
- 4290	0.00	0.00	13.38	6.95	5.27	1.20	6.62	1.75	2.98	61.85	1.43E7	0.18
(176)	0.00	0.00	13.38	20.33	25.60	26.80	33.42	35.17	38.15	100.00		
- 4315	0.00	0.00	12.12	0.00	4.70	1.62	8.06	1.93	6.47	65.10	1.62E7	0.20
(212.5)	0.00	0.00	12.12	12.12	16.81	18.44	26.49	28.42	34.90	100.00		
- 4318	0.00	0.00	9.11	0.00	2.33	1.93	7.52	2.67	0.00	76.45	1.91E7	0.26
(272.5)	0.00	0.00	9.11	9.11	11.43	13.37	20.88	23.55	23.55	100.00		
- 4319	0.00	0.00	9.39	0.00	2.49	1.67	6.70	2.06	0.00	77.69	1.51E7	0.25
(288.5)	0.00	0.00	9.39	9.39	11.88	13.55	20.25	22.31	22.31	100.00		
- 4321	0.00	0.00	16.60	0.00	5.84	0.65	6.43	5.28	0.00	65.20	1.27E7	0.10
(323.5)	0.00	0.00	16.60	16.60	22.44	23.09	29.52	34.80	34.80	100.00		
- 4291	0.00	0.00	10.42	5.77	2.39	1.47	7.89	2.30	2.45	67.30	1.61E7	0.19
(389)	0.00	0.00	10.42	16.19	18.58	20.05	27.95	30.25	32.70	100.00		
- 4322	0.00	0.00	17.48	0.00	7.10	1.48	7.56	4.43	0.00	61.95	1.43E7	0.20
(381)	0.00	0.00	17.48	17.48	24.58	26.07	33.62	38.05	38.05	100.00		
- 4324	0.00	0.00	16.48	0.00	4.31	0.83	7.18	1.93	0.00	69.27	1.35E7	0.12
(446)	0.00	0.00	16.48	16.48	20.79	21.62	28.80	30.73	30.73	100.00		
- 4326	0.00	0.00	13.32	0.00	3.64	1.64	6.57	3.50	0.00	71.34	1.38E7	0.25
(505)	0.00	0.00	13.32	13.32	16.96	18.59	25.16	28.66	28.66	100.00		
- 4327	0.00	0.00	14.75	0.00	3.20	0.70	6.38	2.98	0.00	71.99	1.59E7	0.11
(555)	0.00	0.00	14.75	14.75	17.95	18.65	25.03	28.01	28.01	100.00		

TABLE 15-5-C (cont.)

SEDIMENTOLOGY LABORATORY - INSTAAR
Semiquantitative Results Of <2µm Bulk Mineralogy
HU82-CLS
CLARK FIORD

Mineral Area Distribution - Per Mineral & Cumulative Percent

LABORATORY NUMBER (DEPTH cm)	DOL	CAL	PLAG	KSPAR	QTZ 2	KAOL	CHLOR	AMPHI	SMECT	MICA	TOTAL AREA	K/C RATIO
- 4328	0.00	0.00	19.05	0.00	5.79	1.46	3.61	1.71	0.00	68.38	1.20E7	0.40
(405)	0.00	0.00	19.05	19.05	24.84	26.30	29.91	31.62	31.62	100.00		
- 4329	0.00	0.00	12.10	0.00	2.83	0.54	6.90	2.99	0.00	74.64	1.45E7	0.08
(655)	0.00	0.00	12.10	12.10	14.93	15.47	22.37	25.36	25.36	100.00		
- 4330	0.60	0.00	11.86	0.00	5.53	0.77	6.72	2.68	0.00	71.84	1.45E7	0.11
(693)	0.60	0.60	12.46	12.46	17.99	18.76	25.48	28.16	28.16	100.00		
SRL - 4331	0.00	0.00	22.15	0.00	3.85	1.54	3.80	1.82	0.00	66.84	1.05E7	0.40
(753)	0.00	0.00	22.15	22.15	26.00	27.54	31.34	33.16	33.16	100.00		
- 4333	0.00	0.00	22.05	0.00	6.99	0.47	6.04	3.44	0.00	61.00	1.23E7	0.08
(802.5)	0.00	0.00	22.05	22.05	29.05	29.52	35.56	39.00	39.00	100.00		
- 4335	0.00	0.00	15.25	0.00	4.66	0.36	8.60	3.53	0.00	67.60	1.42E7	0.04
(845)	0.00	0.00	15.25	15.25	19.91	20.27	28.87	32.40	32.40	100.00		
- 4336	0.00	0.00	13.37	6.88	3.37	0.00	6.02	1.46	0.00	68.90	1.50E7	0.00
(902.5)	0.00	0.00	13.37	20.25	23.62	23.62	29.63	31.10	31.10	100.00		
- 4337	0.00	0.00	12.01	0.00	2.23	0.37	5.48	0.98	0.00	78.94	1.67E7	0.07
(953.5)	0.00	0.00	12.01	12.01	14.23	14.60	20.08	21.06	21.06	100.00		
- 4293	0.00	0.00	15.36	0.00	3.24	0.82	7.48	4.88	0.00	68.22	1.30E7	0.11
(971.5)	0.00	0.00	15.36	15.36	18.60	19.42	26.90	31.78	31.78	100.00		

Quantification Determined From Glycolated Test Using DSDP Factors.

Test Run - 37 - 4 (2 θ) Scan: 2.0 2 θ/min. Chart Speed: 2cm./min.
K/C Slow Scan - 25.25 - 24.5 (2 θ) Scan: 0.5 2 θ/min. Chart Speed: 2cm./min.

TABLE 15-5-D

SEDIMENTOLOGY LABORATORY - INSTAAR
Semiquantitative Results Of <2µm Bulk Mineralogy

SUNNESHINE FIORD, 1982

Mineral Area Distribution - Per Mineral & Cumulative Percent

LABORATORY NUMBER	DEPTH (cm.)	DOL	CAL	PLAG	KSPAR	QTZ 2	K + C	AMPHI	SMECT	MICA	TOTAL AREA
SRL - 4338	19	0.00	0.00	4.80	0.00	0.00	4.44	2.28	0.00	88.48	1.08E7
		0.00	0.00	4.80	4.80	4.80	9.24	11.52	11.52	100.00	
- 4342	103	0.00	0.00	9.00	0.00	0.00	2.89	0.00	7.48	80.63	1.32E7
		0.00	0.00	9.00	9.00	9.00	11.89	11.89	19.37	100.00	
- 4345	162	0.00	0.57	6.74	0.00	0.00	3.81	0.00	0.00	88.88	9.02E6
		0.00	0.57	7.31	7.31	7.31	11.12	11.12	11.12	100.00	
- 4349	243.5	0.00	0.81	11.84	0.00	1.66	5.70	4.00	0.00	75.99	1.22E7
		0.00	0.81	12.65	12.65	14.30	20.00	24.01	24.01	100.00	
- 4352	321.5	0.00	0.00	12.59	0.00	5.58	5.95	2.64	3.58	69.65	1.21E7
		0.00	0.00	12.59	12.59	18.17	24.12	26.76	30.35	100.00	
- 4353	374.5	0.00	0.00	4.24	0.00	1.04	7.35	2.34	4.08	80.97	2.16E7
		0.00	0.00	4.24	4.24	5.27	12.62	14.95	19.03	100.00	
- 4355	423.5	0.96	0.00	2.04	1.08	0.86	10.91	2.17	15.41	66.59	2.41E7
		0.96	0.96	2.99	4.07	4.93	15.83	18.01	33.41	100.00	
- 4357	466.5	1.29	0.35	4.13	0.00	0.00	9.42	1.95	16.17	66.70	2.23E7
		1.29	1.63	5.76	5.76	5.76	15.18	17.13	33.30	100.00	
- 4359	505.5	1.30	0.90	0.00	6.90	2.46	10.63	2.55	10.80	64.44	2.70E7
		1.30	2.20	2.20	9.10	11.57	22.20	24.75	35.56	100.00	

Quantification Determined From Glycolated Test Using DSDP Factors.

Test Run - 37 - 4 (2 θ) Scan: 2.0 2 θ/min. Chart Speed: 2cm./min.

K/C Slow Scan - 25.25 - 24.5 (2 θ) Scan: 0.5 2 θ/min. Chart Speed: 2cm./min.

TABLE 15-5-D (cont.)

SEDIMENTOLOGY LABORATORY - INSTAAR
Semiquantitative Results Of <2µm Bulk Mineralogy

SUNNESHINE FIORD. 1982

Mineral Area Distribution - Per Mineral & Cumulative Percent

LABORATORY NUMBER	DEPTH (cm.)	DOL	CAL	PLAG	KSPAR	QTZ 2	K + C	AMPHI	SMECT	MICA	TOTAL AREA
- 4361	543.5	1.97	0.61	5.46	3.46	2.34	13.25	2.08	13.91	56.93	3.16E7
		1.97	2.58	8.04	11.50	13.84	27.08	29.16	43.07	100.00	
- 4401	571	0.00	0.00	2.20	0.00	1.19	14.92	2.18	10.76	68.75	2.51E7
		0.00	0.00	2.20	2.20	3.39	18.31	20.49	31.25	100.00	
- 4402	609	1.64	0.00	7.06	0.00	2.13	17.01	1.37	6.81	63.99	1.85E7
		1.64	1.64	8.69	8.69	10.83	27.83	29.20	36.01	100.00	
- 4365	622	1.89	0.00	3.41	2.30	1.58	11.86	2.03	17.46	59.48	2.30E7
		1.89	1.89	5.30	7.60	9.17	21.03	23.06	40.52	100.00	
- 4366	653.5	0.00	0.00	5.75	0.00	1.44	16.43	1.73	18.52	56.14	2.60E7
		0.00	0.00	5.75	5.75	7.18	23.61	25.34	43.86	100.00	
- 4368	710	0.00	0.00	6.01	0.00	1.16	14.36	3.13	15.51	59.83	3.53E7
		0.00	0.00	6.01	6.01	7.17	21.53	24.67	40.17	100.00	
- 4371	763.5	0.00	0.00	4.37	2.80	0.64	10.90	3.48	13.45	64.36	3.46E7
		0.00	0.00	4.37	7.17	7.81	18.71	22.19	35.64	100.00	

Quantification Determined From Glycolated Test Using BSDP Factors.
Test Run - 37 - 4 (2 θ) Scan: 2.0 2 θ/min. Chart Speed: 2cm./min.
K/C Slow Scan - 25.25 - 24.5 (2 θ) Scan: 0.5 2 θ/min. Chart Speed: 2cm./min.

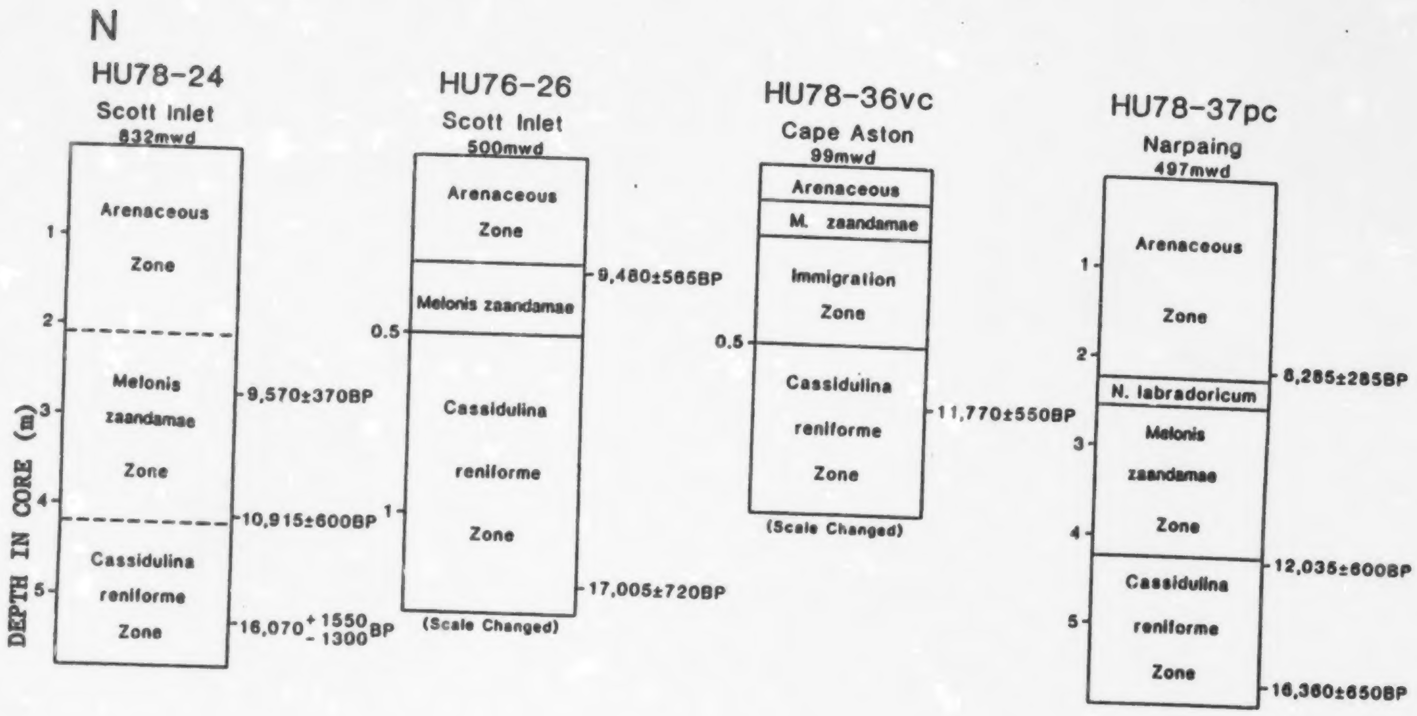


Figure 15-6-1) Benthic foraminiferal zonation of four marine cores from the northern continental shelf of Baffin Island

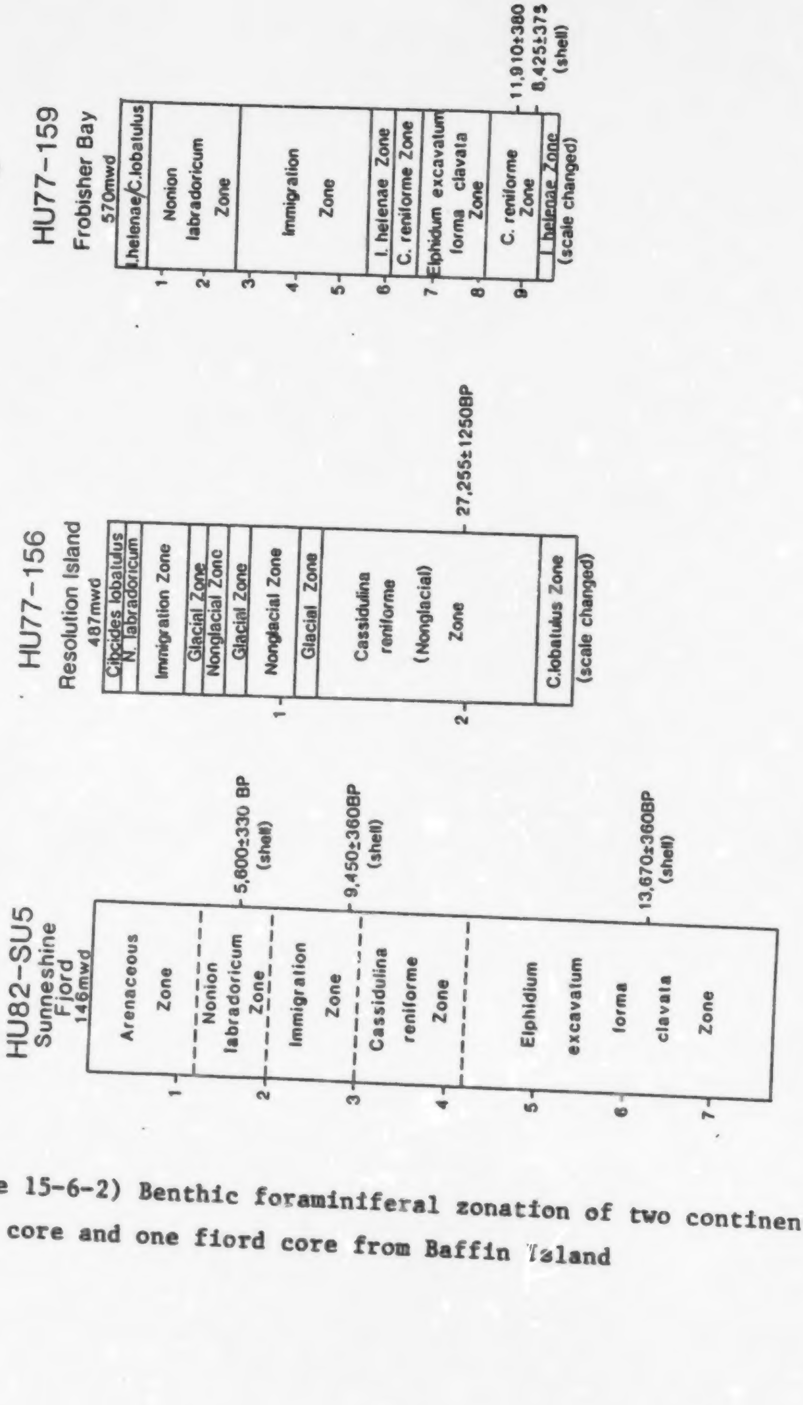


Figure 15-6-2) Benthic foraminiferal zonation of two continental shelf core and one fiord core from Baffin Island

TABLE 15-7-A
DIATOM SPECIES LIST, CLARK FJORD.

CHAETOCEROS SP. SPORES
THALASSIOSIRA GRAVIDA
ACTINOCYCLUS CURVATULUS
T. TRIFULTA
POROSIRA GLACIALIS
POROSIRA SPORES
T. HYALINA
COSCINOCISCUS LACUSTRIS
NITZSCHIA GRUNOWII
N. CYLINDRUS
THALASSIONEMA NITZSCHIOIDES
GRAMMATOPHORA SP.
C. OCULUS-IRIDIS
RHIZOSOLENIA HEBETATA
NAVICULA DIRECTA
N. GLACIALIS
N. DIPLONEOIDES
N. SP.
C. SP.
THALASSIOSIRA SP.
COCCONEIS SP.
DIPLONEIS SP.
NITZSCHIA SP.
N. SP. A
N. cf. SIGMOIDES
AMPHORA SP.
TRACHYNEIS ASPERA
DICLADIA PYLEA
AMPHIPRORA SP.
EUNOTIA SP.
SYNEDRA TABULATA
THALASSIOSIRA NORDENSKIOLDII
T. OESTRUPII
PINNULARIA SP.
BACTEROSIRA FRAGILIS
UNIDENTIFIED, CENTRALES
UNIDENTIFIED, PENNALES

TABLE 15-7-B

DIATOMS CLARK FIORD STATION # 1

SAMPLE CLARK FJ. STA.#1

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	45	42	
T.GRAVIDA	1	1	2
A.CURV.		0	0
T.TRIFULT	2	2	3
P.GLACIAL	1	1	2
P.GL.SPORE		0	0
T.HYALINA		0	0
C.LACUST.		0	0
N.GRUNOW	7	7	11
N.CYLIND	6	6	10
T.NITZ	3	3	5
GRAMMATO		0	0
C.OCUL-IRI		0	0
R.HEBET		0	0
NAV.DIR		0	0
NAV.GLAC		0	0
NAV.DIPLON	23	22	38
NAV.SP		0	0
COSC.SP		0	0
THAL.SP		0	0
COCCONE		0	0
DIPLON.SP.		0	0
NIT.SP.	2	2	3
NIT.cf.SIG		0	0
AMPHORA	1	1	2
TRA.ASPERA		0	0
DIC.PYLEA		0	0
AMPHIPRORA		0	0
EUNOTIA		0	0
SYN.TABUL		0	0
T.NORDEN		0	0
T.OESTR		0	0
PINNUL.SP.		0	0
BACT.FRAGI		0	0
UNID. C	7	7	11
UNID. P	8	8	13
SUM	106		
SUM II	61		

TABLE 15-7-C

DIATOMS CLARK FIORD STATION # 2

SAMPLE CLARK FJ. STA.#2

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	46	38	
T.GRAVIDA	5	4	7
A.CURV.		0	0
T.TRIFULT	6	5	8
P.GLACIAL		0	0
P.GL.SPORE	2	2	3
T.HYALINA		0	0
C.LACUST.	8	7	11
N.GRUNOW		0	0
N.CYLIND	2	2	3
T.NITZ	3	2	4
GRAMMATO T		0	0
C.OCUL-IRI		0	0
R.HEBET		0	0
NAV.DIR		0	0
NAV.GLAC		0	0
NAV.DIPLON	15	12	20
NAV.SP		0	0
COSC.SP		0	0
THAL.SP		0	0
COCCONE		0	0
DIPLON.SP.		0	0
NIT.A		0	0
NIT.cf.SIG		0	0
AMPHORA		0	0
TRA.ASPERA		0	0
DIC.PYLEA		0	0
AMPHIPRORA		0	0
EUNOTIA		0	0
SYN.TABUL		0	0
T.NORDEN		0	0
T.OESTR		0	0
PINNUL.SP.		0	0
BACT.FRAGI		0	0
UNID. C	32	26	42
UNID. P	3	2	4
SUM	122		
SUM II	76		

TABLE 15-7-D

DIATOMS CLARK FIORD STATION # 3

SAMPLE CLARK FJ. STA.#3

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	33	14	
T.GRAVIDA	19	8	10
A.CURV.	1	0	1
T.TRIFULT	28	12	14
P.GLACIAL	4	2	2
P.GL.SPORE	4	2	2
T.HYALINA	6	3	3
C.LACUST.	38	17	19
N.GRUNOW	15	7	8
N.CYLIND	10	4	5
T.NITZ	1	0	1
GRAMMATO		0	0
C.OCUL-IRI		0	0
R.HEBET		0	0
NAV.DIR		0	0
NAV.GLAC		0	0
NAV.DIPLON	24	10	12
NAV.SP	2	1	1
COSC.SP		0	0
THAL.SP	3	1	2
COCCONE		0	0
DIPLON.SP.	4	2	2
NIT.A	2	1	1
NIT.cf.SIG		0	0
AMPHORA		0	0
TRA.ASPERA		0	0
DIC.PYLEA		0	0
AMPHIPRORA		0	0
EUNOTIA		0	0
SYN.TABUL		0	0
T.NORDEN	2	1	1
T.OESTR	4	2	2
PINNUL.SP.	1	0	1
BACT.FRAGI	1	0	1
UNID. C	14	6	7
UNID. P	14	6	7
SUM	230		
SUM II	197		

TABLE 15-7-E

DIATOMS CLARK FIORD STATION # 5

SAMPLE CLARK FJ. STA. #5

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	85	47	
T.GRAVIDA	2	1	2
A.CURV.		0	0
T.TRIFULT	6	3	6
P.GLACIAL		0	0
P.GL.SPORE	1	1	1
T.HYALINA	1	1	1
C.LACUST.	14	8	15
N.GRUNOW	5	3	5
N.CYLIND	8	4	8
T.NITZ		0	0
GRAMMATO		0	0
C.OCUL-IRI		0	0
R.HEBET		0	0
NAV.DIR		0	0
NAV.GLAC		0	0
NAV.DIPLON	34	19	35
NAV.SP	1	1	1
COSC.SP	0	0	0
THAL.SP		0	0
COCCONE	2	1	2
DIPLON.SP.	2	1	2
NIT.SP.	2	1	2
NIT.cf.SIG		0	0
AMPHORA		0	0
TRA.ASPERA		0	0
DIC.PYLEA		0	0
AMPHIPRORA		0	0
EUNOTIA	2	1	2
SYN.TABUL	5	3	5
T.NORDEN	3	2	3
T.OESTR		0	0
PINNUL.SP.		0	0
BACT.FRAGI		0	0
UNID. C	4	2	4
UNID. P	4	2	4
SUM	181		
SUM II	96		

TABLE 15-7-F

DIATOMS CLARK FIORD STATION # 6

SAMPLE CLARK FJ. STA. #6

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	364	75	
T.GRAVIDA	8	2	7
A.CURV.	2	0	2
T.TRIFULT	11	2	9
P.GLACIAL		0	0
P.GL.SPORE	10	2	8
T.HYALINA		0	0
C.LACUST.	10	2	8
N.GRUNOW	17	4	14
N.CYLIND	10	2	8
T.NITZ	2	0	2
GRAMMATO	3	1	2
C.OCUL-IRI		0	0
R.HEBET	3	1	2
NAV.DIR		0	0
NAV.GLAC		0	0
NAV.DIPLON	9	2	7
NAV.SP	2	0	2
COSC.SP	1	0	1
THAL.SP		0	0
COCCONE	1	0	1
DIPLON.SP.	11	2	9
NIT.A	1	0	1
NIT.cf.SIG		0	0
AMPHORA		0	0
TRA.ASPERA		0	0
DIC.PYLEA	1	0	1
AMPHIPRORA		0	0
EUNOTIA		0	0
SYN.TABUL		0	0
T.NORDEN		0	0
T.OESTR		0	0
PINNUL.SP.		0	0
BACT.FRAGI	1	0	1
UNID. C	7	1	6
UNID. P	11	2	9
SUM	485		
SUM II	121		

TABLE 15-7-G

DIATOMS CLARK FIORD STATION # 7B

SAMPLE CLARK FJ. STA. #7 B

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	275	85	
T.GRAVIDA	6	2	12
A.CURV.	3	1	6
T.TRIFULT	3	1	6
P.GLACIAL		0	0
P.GL.SPORE	2	1	4
T.HYALINA		0	0
C.LACUST.	3	1	6
N.GRUNOW	5	2	10
N.CYLIND	9	3	18
T.NITZ		0	0
GRAMMATO		0	0
C.OCUL-IRI		0	0
R.HEBET		0	0
NAV.DIR	1	0	2
NAV.GLAC		0	0
NAV.DIPLON		0	0
NAV.SP	1	0	2
COSC.SP	1	0	2
THAL.SP		0	0
COCCONE		0	0
DIPLON.SP.	8	2	16
NIT.A		0	0
NIT.cf.SIG		0	0
AMPHORA		0	0
TRA.ASPERA		0	0
DIC.PYLEA		0	0
AMPHIPRORA		0	0
EUNOTIA		0	0
SYN.TABUL		0	0
T.NORDEN		0	0
T.OESTR		0	0
PINNUL.SP.		0	0
BACT.FRAGI		0	0
UNID. C	3	1	6
UNID. P	4	1	8
SUM	324		
SUM II	49		

TABLE 15-7-H

DIATOMS CLARK FIORD STATION #8

SAMPLE CLARK FJ. STA.8

SPECIES	TOTAL	%+CHAET.	%-CHAET.
CHAETOC.	209	69	
T.GRAVIDA	28	9	30
A.CURV.	8	3	9
T.TRIFULT	2	1	2
P.GLACIAL	1	0	1
P.GL.SPORE	5	2	5
T.HYALINA		0	0
C.LACUST.	3	1	3
N.GRUNOW	5	2	5
N.CYLIND		0	0
T.NITZ	5	2	5
GRAMMATO		0	0
C.OCUL-IRI		0	0
R.HEBET	4	1	4
NAV.DIR		0	0
NAV.GLAC	1	0	1
NAV.DIPLON	1	0	1
NAV.SP	2	1	2
COSC.SP		0	0
THAL.SP		0	0
COCCONE	3	1	3
DIPLON.SP.	8	3	9
NIT.A	1	0	1
NITZ.SP.	1	0	1
AMPHORA	3	1	3
TRA.ASPERA	2	1	2
DIC.PYLEA		0	0
AMPHIPRORA		0	0
EUNOTIA		0	0
SYN.TABUL		0	0
T.NORDEN		0	0
T.OESTR		0	0
PINNUL.SP.		0	0
BACT.FRAGI		0	0
UNID. C	11	4	12
UNID. P		0	0
SUM	303		
SUM II	94		

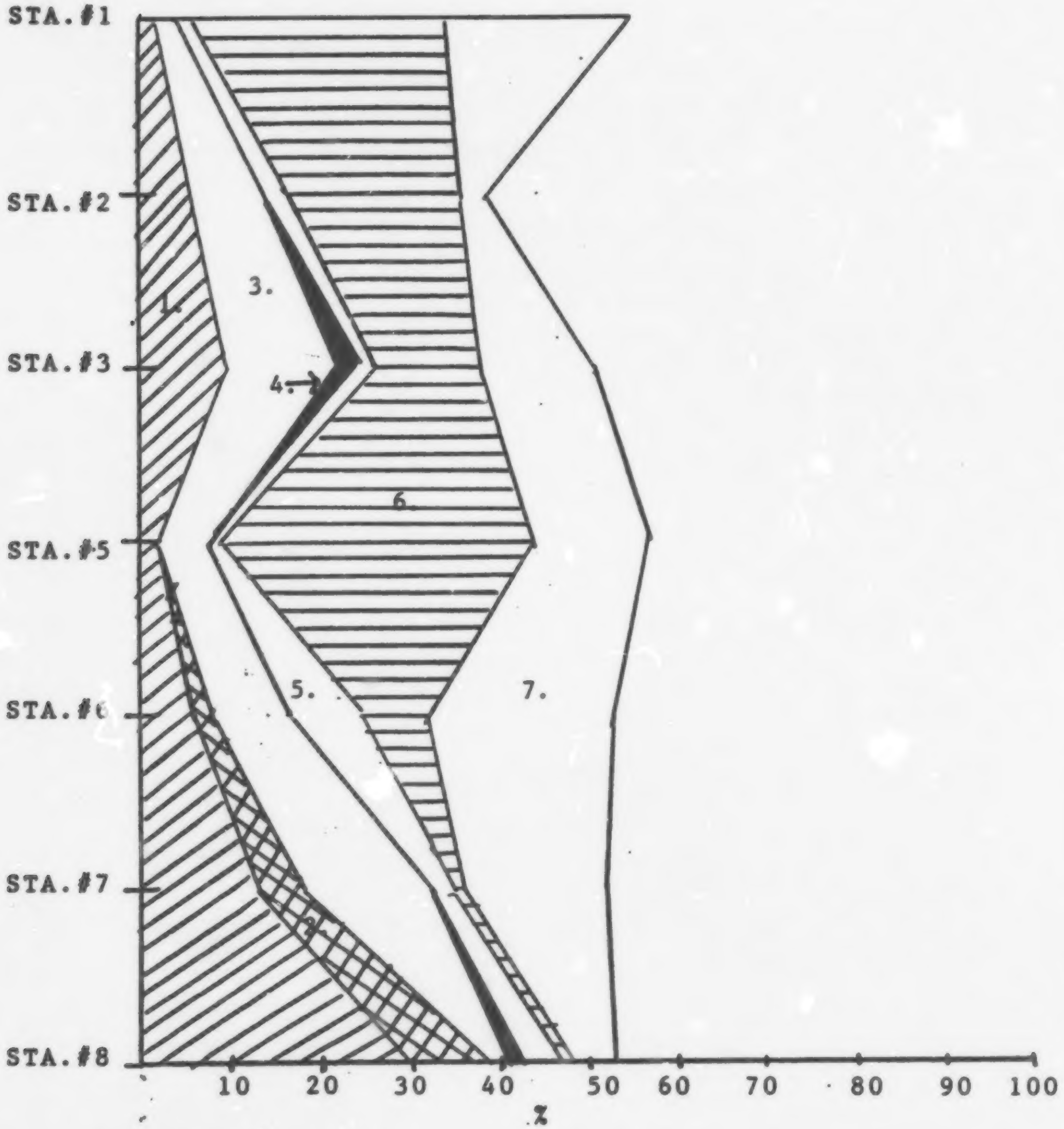


Fig. 15-7-1) Cumulative species percent, Clark Fjord.

SPECIES

1) T. gravida
2) A. curvatulus
3) T. trifulta
4) Porosira glacialis
5) P. spores
6) Navicula Diploneoides
7) N. cylindrus + N. grunowii

PUBLICATIONS, THESES AND ABSTRACTS

PUBLICATIONS:

DOWDESWELL,J.A., OSTERMAN, L.E., and ANDREWS, J.T. in press, Quartz sand grain shape and other criteria used to distinguish glacial and non-glacial events in a marine core from Frobisher Bay, Baffin Island N.W.T., Canada. Sedimentology:_____.

OSTERMAN, L.E. 1984. Benthic foraminiferal zonation of a glacial/interglacial transition from Frobisher Bay, Baffin Island, N.W.T., Canada: In Oertli, H.J. (ed.).Benthos '83 second International Symposia on benthic foraminifera. Pau France.471-476.

OSTERMAN, L.E. and ANDREWS, J.T. 1983. Changes in glacial-marine sedimentation in core HU77-159, Frobisher Bay, Baffin Island, N.W.T.:a record of proximal, distal, and ice-rafting glacial-marine environments: In Molnia, B.F. (ed.). Glacial-marine sediemntation. New York, Plenum Press. 451--493.

THESES:

JENNINGS, A.E. (in prep).Late Quaternary marine sediments from a transect of fiord and shelf environments/ astudy of piston cores from Clark Fiord and Scott Trough, Baffin Island. M.S. thesis, University of Colorado, Boulder. (expected completion Fall, 1984).

WILLIAMS, K. 1984.Marine diatom assemblages from Baffin Bay and Davis Strait. M.S. thesis, University of Colorado, Boulder. 111p.

ABSTRACTS:

ANDREWS, J.T. and JENNINGS, A. 1984. Paleomagnetic reversals in piston cores from Baffin Island fiords and shelf. Arctic Workshop Abstracts 13:48.

ANDREWS, J.T. and JULLS,T. 1984. Comparison of organic and shell dates from cores on the Baffin Island and Labrador shelves and fiords. Arctic Workshop Abstract 13:59.

ANDREWS, J.T. and JULLS, T. 1984. Rates of fiord and shelf sediment accumulation, Baffin Island, Canada, based on ^{14}C accelerator dates on in situ mollusks. Geological Society of America Abstracts with Programs 16:____.

ABSTRACTS (continued):

JENNINGS, A.E., ANDREWS, J.T., and WILLIAMS, K. 1984. Magnetic susceptibility studies on fiord cores and surface sediments: an index of changes in sediment mineralogy and grainsize. Arctic Workshop Abstracts 13:34.

JENNINGS, A.E., GEIRSDOTTER, A., OSTERMAN, L.E., and ANDREWS, J.T. 1984. A late Holocene dissolution event and changes in sediment source of late Pleistocene and Holocene continental shelf sediments, Baffin Island, N.W.T., Canada. Geological Society of America Abstracts with Programs 16:____.

OSTERMAN, L.E. 1984.Late Quaternary foraminifera of continental shelf cores Baffin Island, Canada. American Quaternary Association Program with Abstracts 8:98.

OSTERMAN, L.E. 1984.Late Quaternary benthic foraminifera of Baffin Island continental shelf cores:Geological Society of America Abstracts with programs 16:___.

SAFE: 1983 Geophysical Investigations

by

James P.M. Syvitski

Geological Survey of Canada
Bedford Institute of Oceanography
Box 1006, Dartmouth, N.S.
B2Y 4A2

Objectives

1. Increase the seismic reflection and sidescan sonar surveys in Cambridge, McBeth and Itirbilung fjords as compared to the 1982 surveys (Gilbert and MacLean 1983);

2. Test the new combined low frequency response streamer and high frequency internal hydrophone of the HUNTEC deep towed, high resolution boomer seismic system; and

3. Accurately locate the geophysical profiles in respect to the fjord bathymetry.

Methods:

This year the HUNTEC-sidescan fish was modified by using a lower frequency aluminum boomer plate, 1000 Joule transmitter as well as the addition of a Benthos short streamer. The system produced excellent records at standard 375 Joule output using both internal hydrophone and streamer. These records continually showed 150 to 200 millisecond penetration as well as reliable bedrock events. The acoustic source produces significant power over a wide band of frequencies (800Hz to 10kHz).

The AGC sidescan sonar has a 3km maximum swath width that is at the limit of resolution. The analog system was recorded on paper and with a Racal Store 4DS-FM recorder. The scale lines on the sonograms are 75m wide, independent of range setting. The sonar resonant frequency used was 72.5kHz, beam width of 1.5° horizontal, 20° vertical and band width of 1kHz. The accompanying echogram was recorded on a UGR 196 recorder using a Ratheon PTR 105 transceiver.

The HUDSON positioning used a three-point radar triangulation method. Geophysical tracks are given in Figures 16.1, 16.2 and 16.3. On these track lines are indicated the site location for accompanying records given later in this report. The track lines of the inner fjord were adjusted and placed on the bathymetric charts produced from the Hydrographic surveys (see chapter 20). Both the 1982 and 1983 surveys are given in Figures 16.4, 16.5 and 16.6.

Results:

The most important result was in identifying where the ship crossed the side-wall slopes and thus located apparent bedrock/till sills (see Gilbert, 1983). To date, we have calculated the isopach for McBeth Fiord only (Fig 16.7). Results indicate a simple distribution of glacio-marine/marine sediment with two sediment basins divided by a till-like sill. The outer basin has the deepest accumulation of sediment reaching a maximum of 282m. The inner basin has a maximum thickness of 200m. Figure 16.7 also notes the position of mega-channels. The channels run down slope on either side of the sill and from the fjord head. Figure 16.7 also notes the two-fold increase in side-wall slides or debris flows off the Coriolis (right-hand side facing down fjord) wall.

Figures 16.8 and 16.9 are good examples of the record difference between the higher frequency boomer plate response (upper figures) and the lower frequency Benthos streamer response (lower figures). The low frequency response is less affected by the high water content chaotic debris flows that tend to have transparent hyperbolic signatures. Structure beneath these debris flows are more easily identified and thus thickness of flows more easily calculated.

Figure 16.10 is a possible example of a paleo-ice scoured surface that has been buried by a Holocene ? mud drape (outer part of McBeth Fiord). Other examples of HUNTEC profiles show a variety of features chosen to represent the available complexity in interpreting the seismostratigraphy. Figure 16.11 is an example of the relationship between bedrock, till ? and glaciomarine sediments in the outer part of Itirbilung Fiord. Figure 16.12 is given as an example of a till (morainal) unit interfingered with a proximal varved unit. Other stratigraphic examples with possible interpretation are given in Figures 16.13, 16.14 and 16.15.

Examples of some interesting side scan sonographs are given in figures 16.16 to 16.23. Figure 16.16 is from the inner part of Itirbilung Fiord: noteworthy are a sidewall debris flow and terraces of older glaciomarine sediment cut retrogressively by slides. Figure 16.17 is from a similar location from McBeth Fiord: note also similar debris flow and slide features. Figure 16.18 provides three other typical morphological forms on the fjord sidewalls: gullied slopes, compression toes and debris mantled slopes with occasional subaqueous fanglomerate. Figures 16.19 and 16.20 are from the Home Bay Shelf environment off of Itirbilung Fiord. They are excellent examples of outcrops of bedrock intermixed with sand or mud. Figure 16.21 is a classic side scan record where folding in the bedrock is evident with jointing and glacial striations marking the surface. The bedrock feature results in an outer sill to the fjord. figures 16.22 and 16.23 are examples of icebergs scoured seafloor in the outer approaches to McBeth Fiord.

References

Gilbert, R. and B. Maclean. 1983. Geophysical studies based on conventional shallow and HUNTEC high resolution seismic surveys of fjords on Baffin Island. in Syvitski, J.P.M. and Blakeney, C.P. (compilers) 1983. Sedimentology of Arctic Fjords Experiment: HU 82-031 data report, Volume 1. Can. Data Rep. Hydrogr. Ocean Sci. No. 12, 15-1 to 15-90.

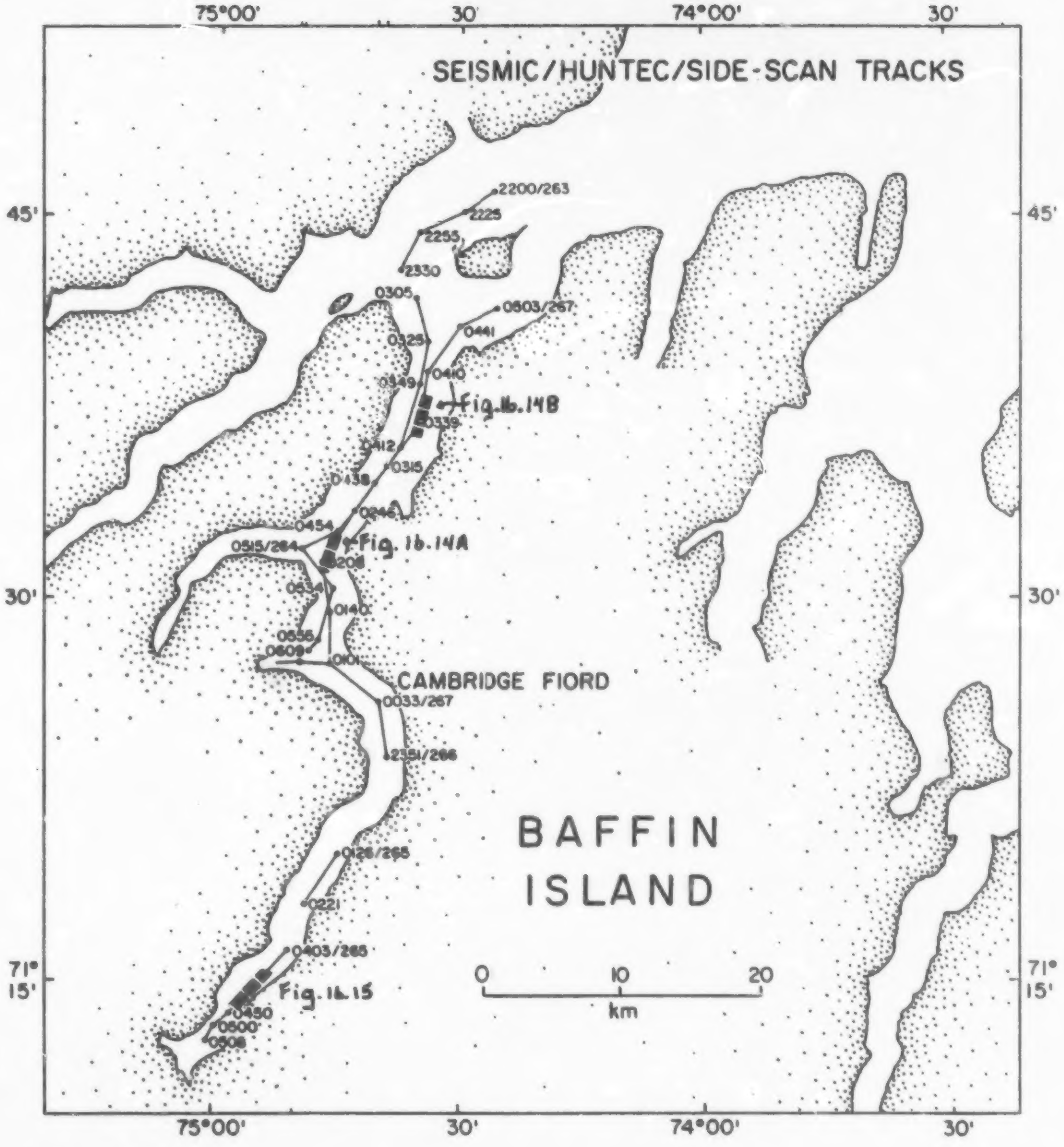

75°00'
30'
74°00'
30'
SEISMIC/HUNTEC/SIDE-SCAN TRACKS
45'
30'
71°
15'
2200/263
2225
2255
2330
0305
0503/267
0441
0325
0410
0349
Fig. 16.14B
0339
0412
0315
0438
0246
0454
0515/264
Fig. 16.14A
0208
0534
0140
0555
0609
0101
CAMBRIDGE FIORD
0033/267
2351/266
BAFFIN
ISLAND
0126/265
0221
0403/265
0
10
20
km
Fig. 16.15
0450
0500
0508

Figure 16.1

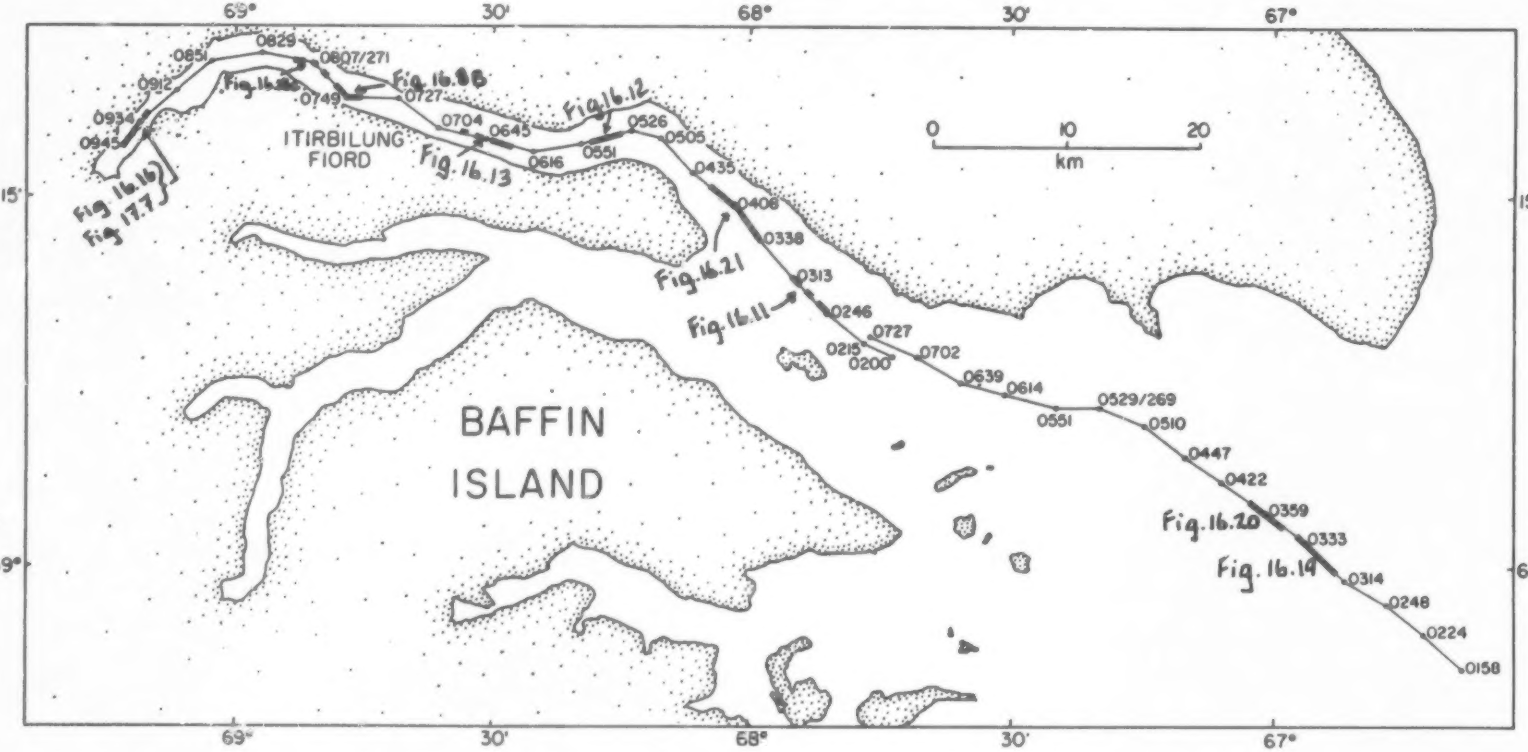

69°
30'
68°
30'
67°
15'
69°
BAFFIN
ISLAND
ITIRBILUNG
FIORD
0
10
20
km
0945
0934
0912
0851
0829
0807/271
0749
0727
0704
0645
0616
0551
0526
0505
0435
0408
0338
0313
0246
0215
0200
0727
0702
0639
0614
0551
0529/269
0510
0447
0422
0359
0333
0314
0248
0224
0158
Fig. 16.16
Fig. 17.7
Fig. 16.13
Fig. 16.12
Fig. 16.21
Fig. 16.11
Fig. 16.20
Fig. 16.19

Figure 16.2

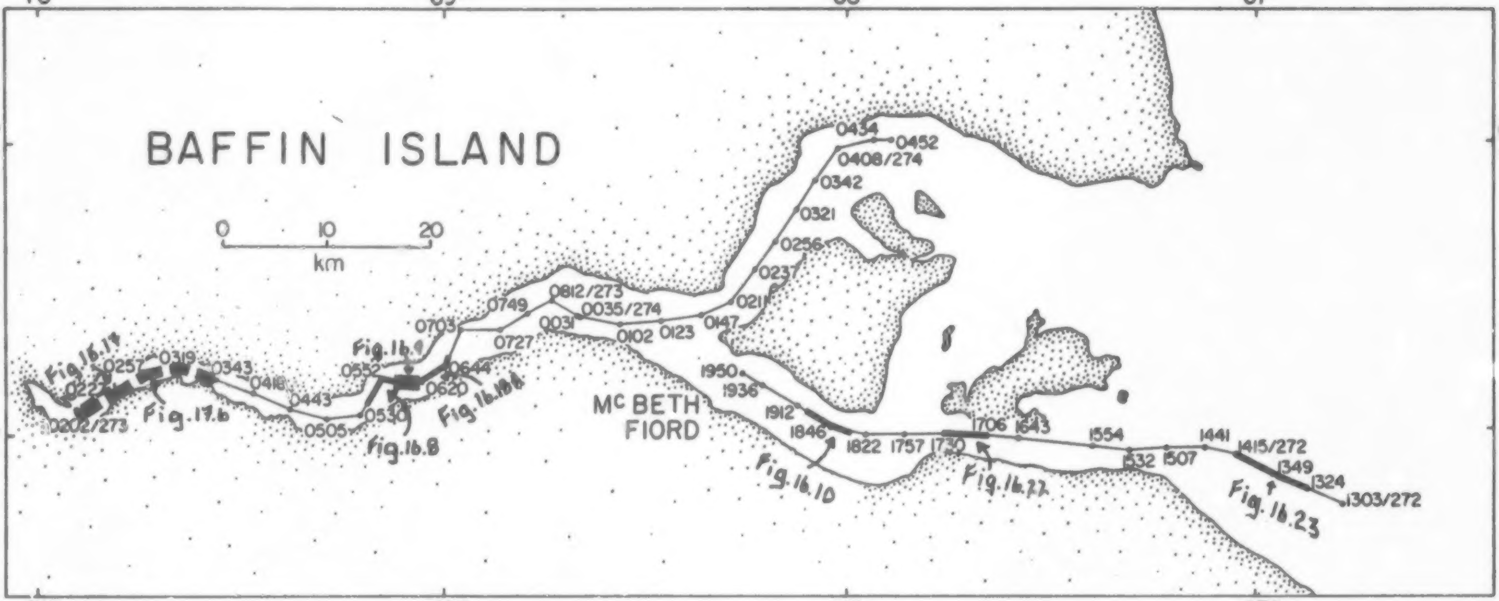

70°
69°
68°
67°
69° 45'
30'
BAFFIN ISLAND
0
10
20
km
Mc BETH FIORD
0434
0452
0408/274
0342
0321
0256
0237
0211
0147
0123
0102
0035/274
0031
0812/273
0749
0727
0703
0644
0620
0552
0530
0505
0443
0418
0343
0319
0257
0222
0202/273
1950
1936
1912
1846
1822
1757
1730
1706
1643
1554
1532
1507
1441
1415/272
1349
1324
1303/272
Fig. 16.19
Fig. 17.6
Fig. 16.9
Fig. 16.8
Fig. 16.18
Fig. 16.10
Fig. 16.22
Fig. 16.23

Figure 16.3

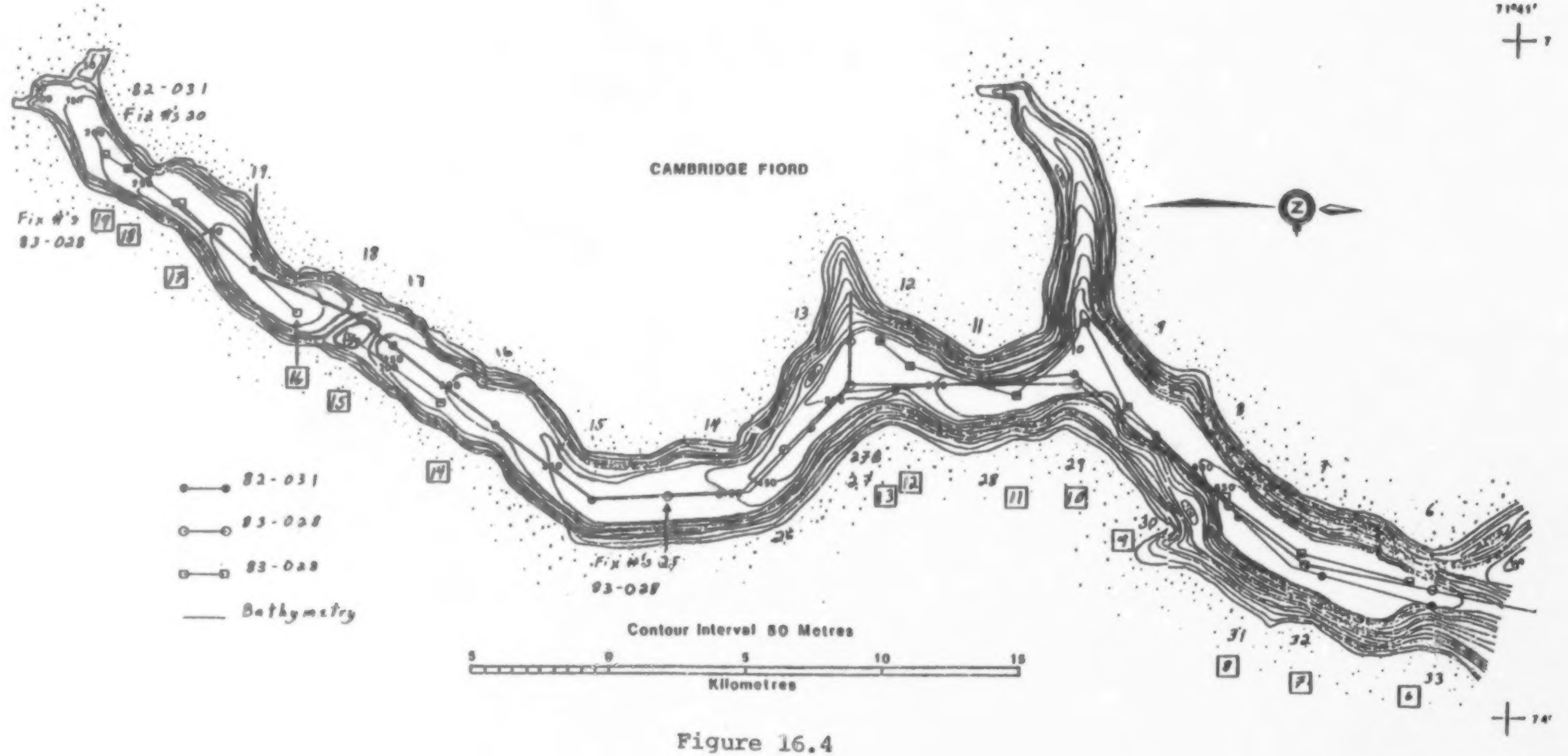

CAMBRIDGE FIORD
71°41'
74'
82-031
Fix #'s 30
Fix #'s 19 18
83-028
Fix #'s 25
83-028
6
7
8
9
11
12
13
14
15
16
17
18
19
27
27a
28
29
30
31
32
33
82-031
83-028
83-028
Bathymetry
Contour Interval 50 Metres
5
0
5
10
15
Kilometres

Figure 16.4

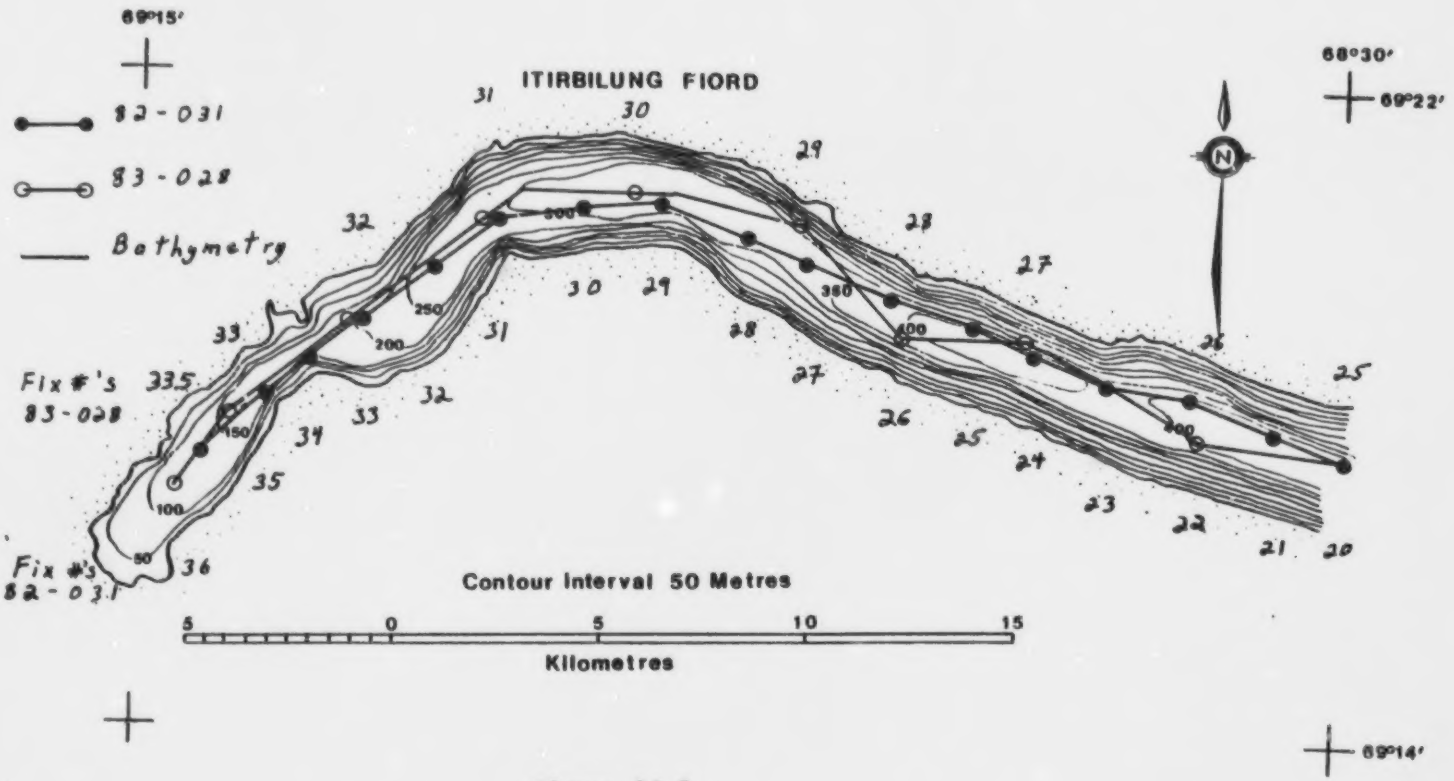

ITIRBILUNG FIORD
69°15'
68°30'
69°22'
69°14'
82-031
83-028
Bathymetry
Fix #'s 83-028
Fix #'s 82-031
N
31
30
29
28
27
26
25
32
33
33.5
34
35
36
30
29
28
27
26
25
24
23
22
21
20
31
32
33
50
100
150
200
250
300
350
400
300
Contour Interval 50 Metres
5
0
5
10
15
Kilometres

Figure 16.5

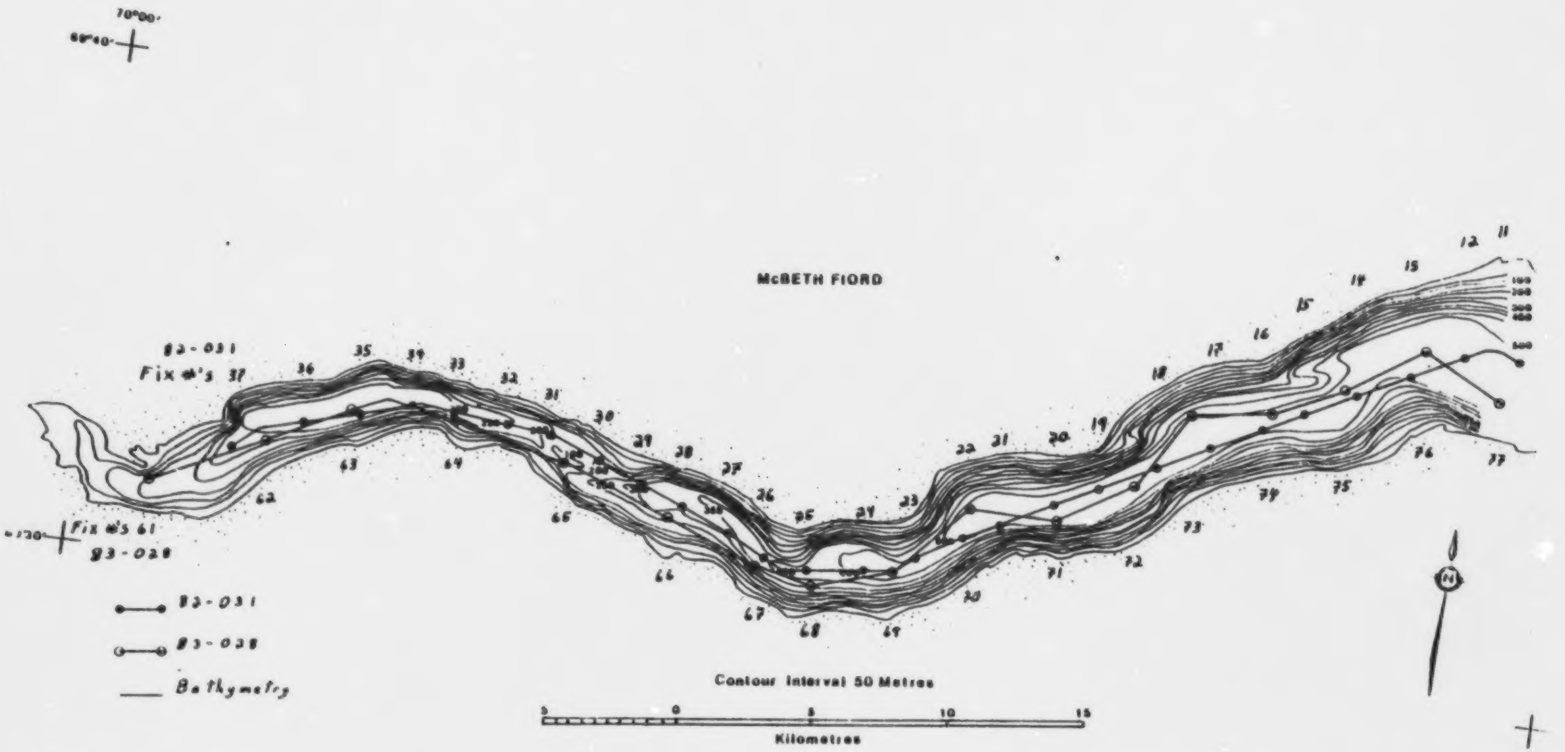

70°00'
69°40'
McBETH FIORD
83-031
Fix #'s 37
36
35
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
100
200
300
400
500
Fix #'s 61
83-028
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
N
83-031
83-028
Bathymetry
Contour Interval 50 Metres
5
0
5
10
15
Kilometres

Figure 16.6

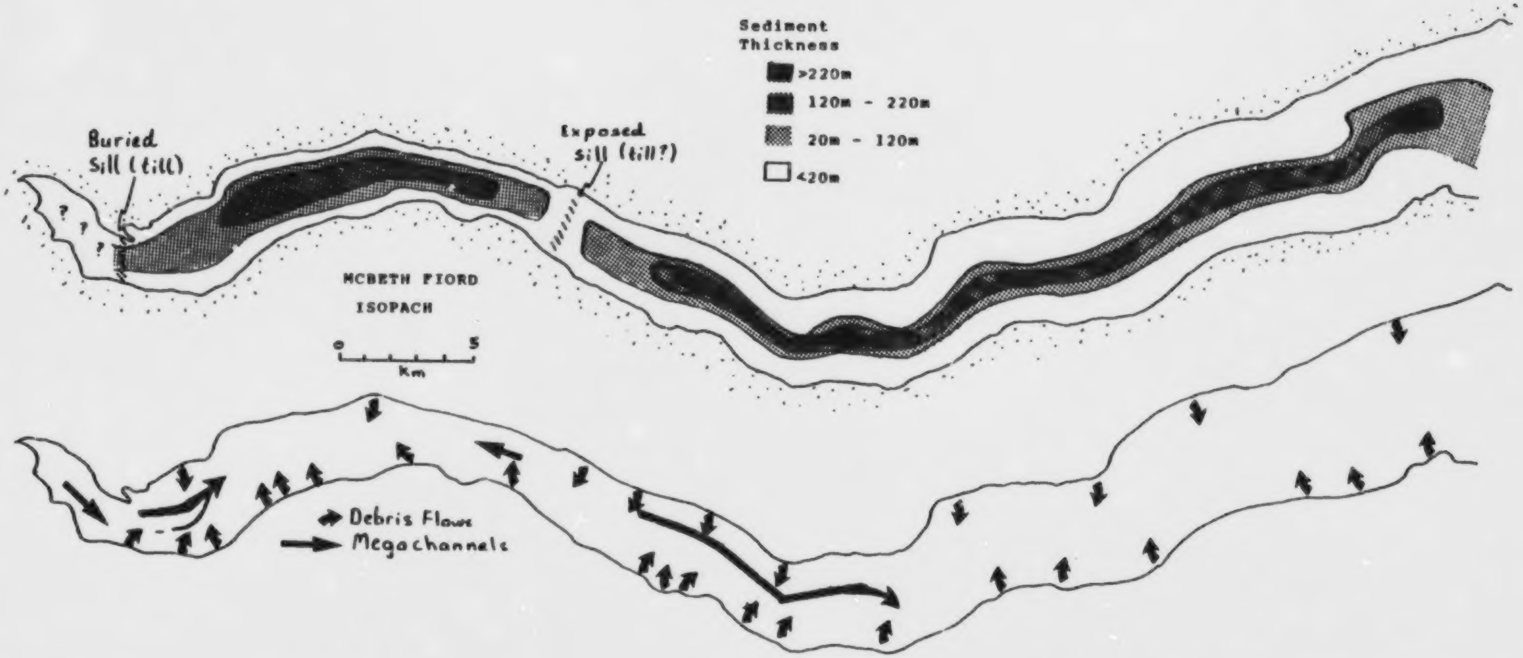

Sediment Thickness
▇ >220m
▇ 120m - 220m
▨ 20m - 120m
☐ <20m
Buried Sill (till)
Exposed sill (till?)
MCBETH FIORD
ISOPACH
0 5
Km
Debris Flows
Megachannels

Figure 16.7

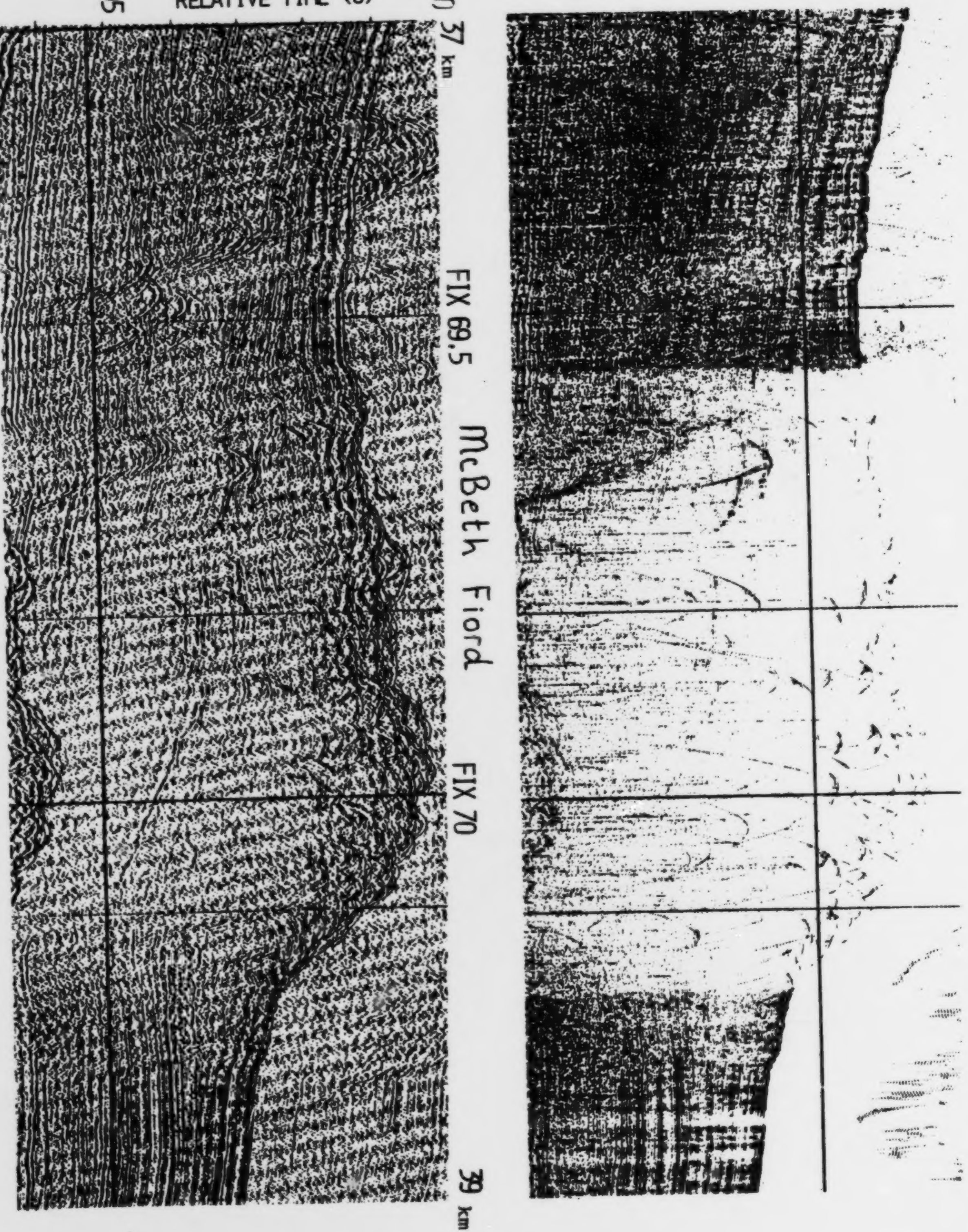
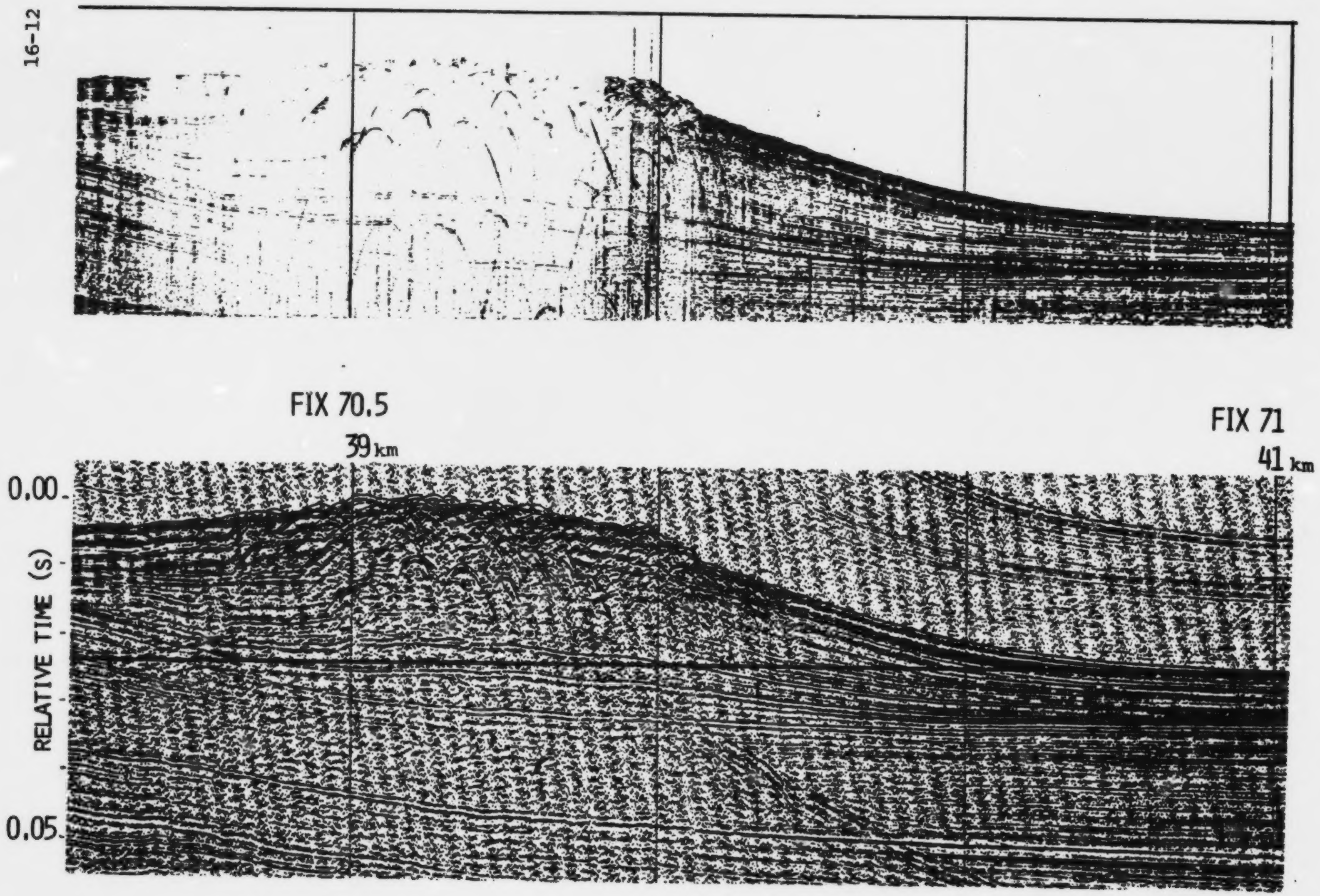


Figure 16.8



McBeth Fiord
Figure 16.9

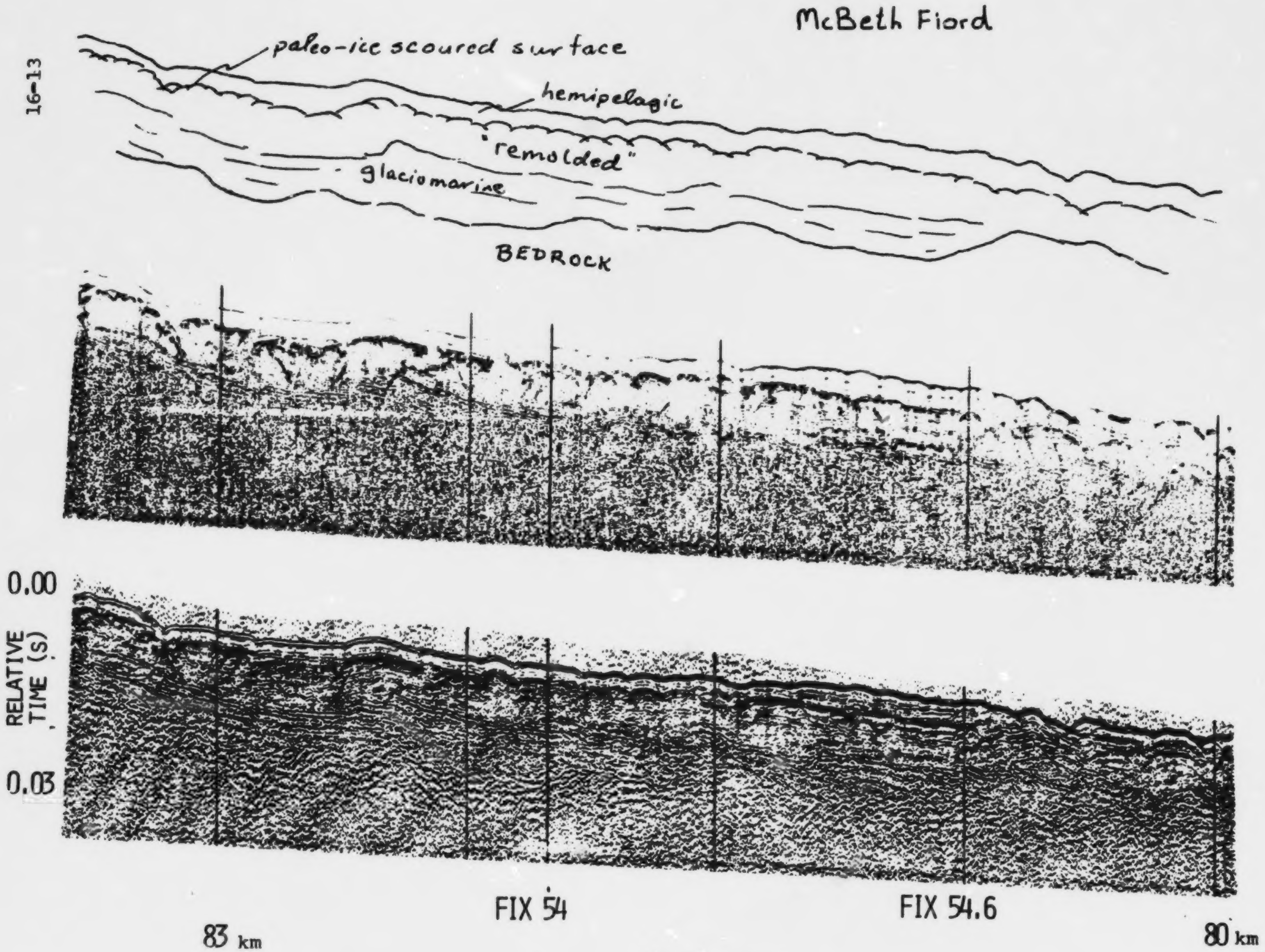

McBeth Fiord
paleo-ice scoured surface
hemipelagic
"remolded"
glaciomarine
BEDROCK
0.00
RELATIVE TIME (s)
0.03
FIX 54
FIX 54.6
83 km
80 km

Figure 16.10

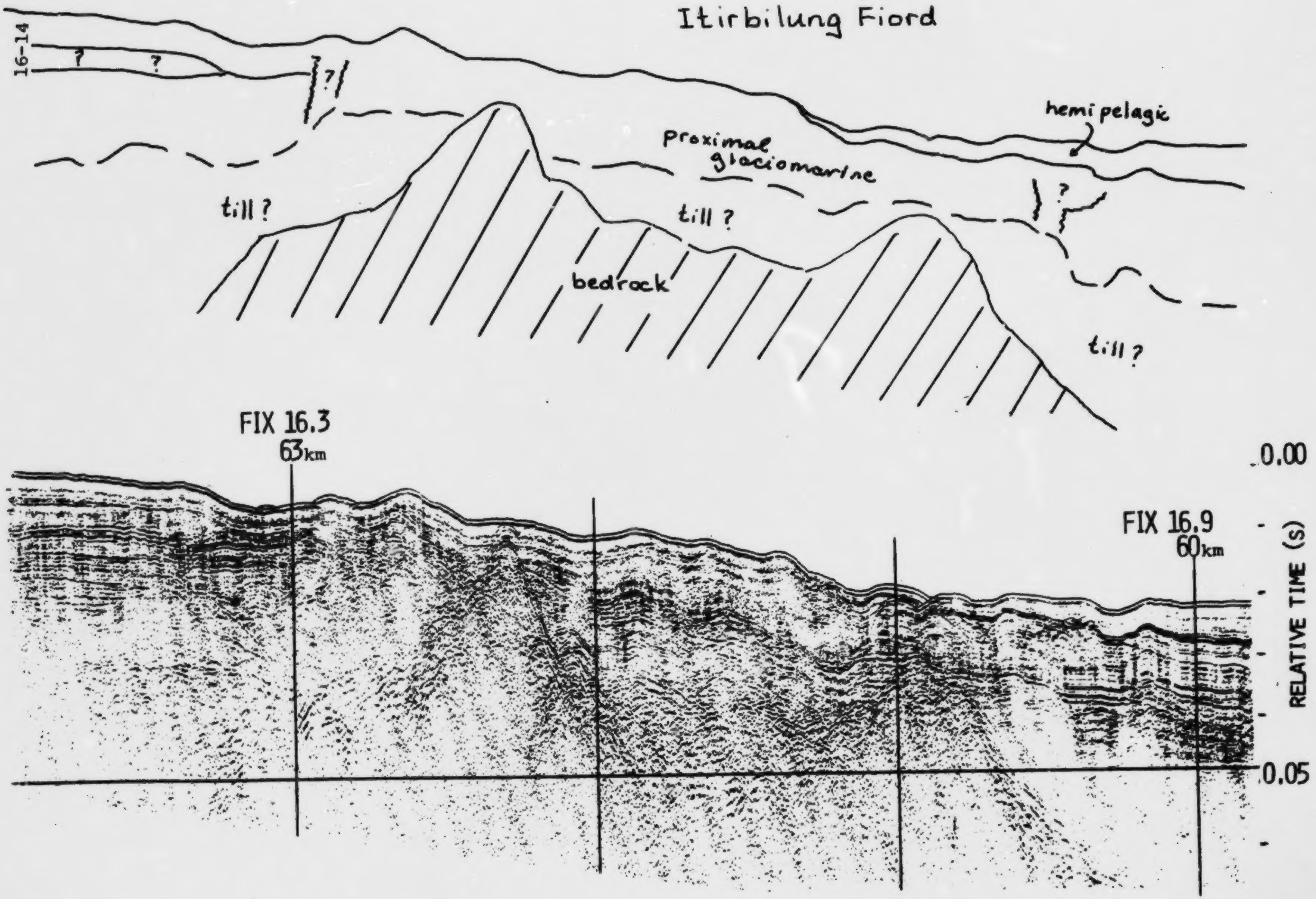
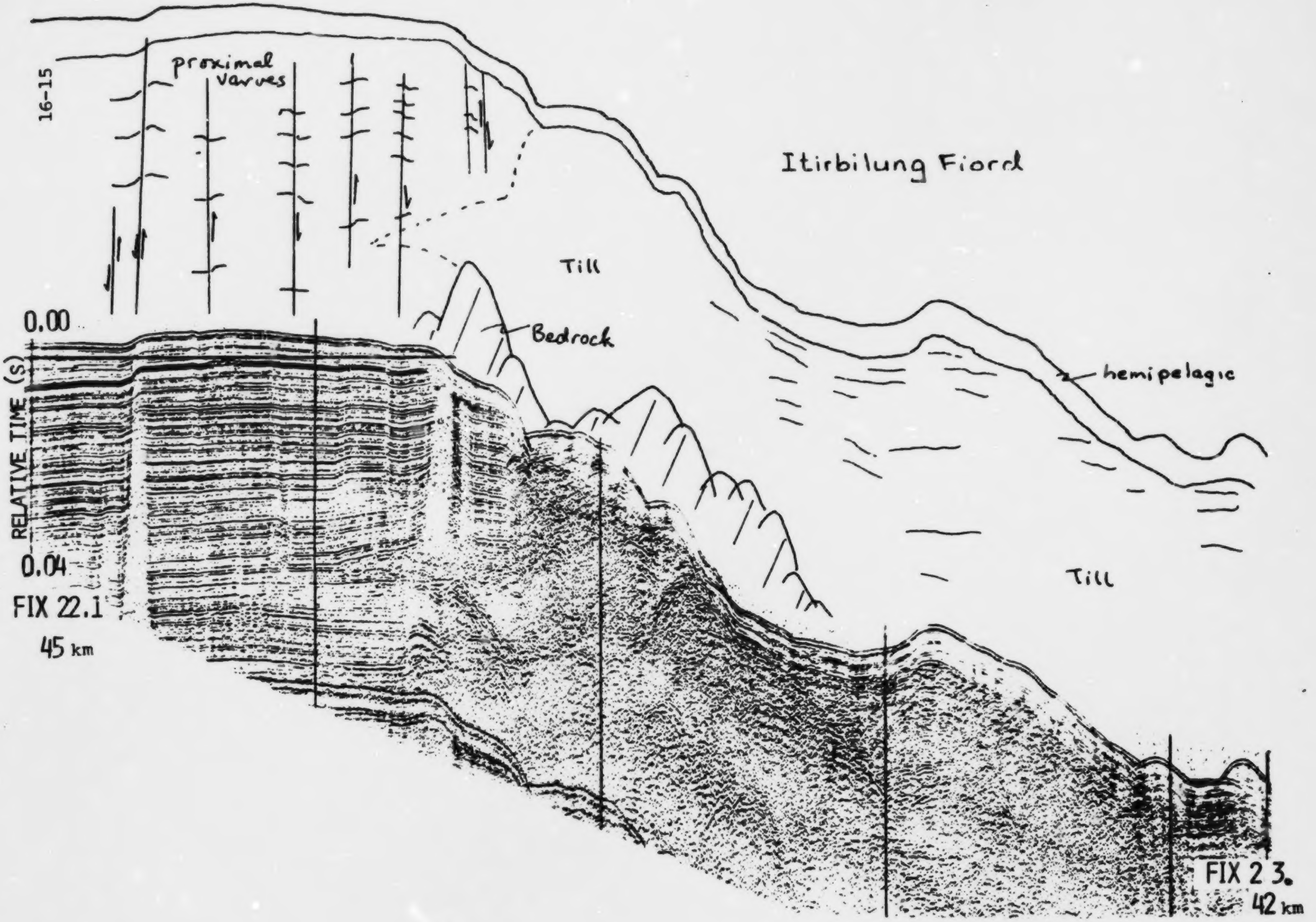

Itirbilung Fiord
16-14
?
?
?
hemi pelagic
proximal glaciomarine
till ?
till ?
bedrock
?
till ?
FIX 16.3
63km
FIX 16.9
60km
0.00
RELATIVE TIME (s)
0.05

Figure 16.11


Itirbilung Fiord
proximal varves
Till
Bedrock
hemipelagic
Till
0.00
RELATIVE TIME (s)
0.04
FIX 22.1
45 km
FIX 2 3.
42 km

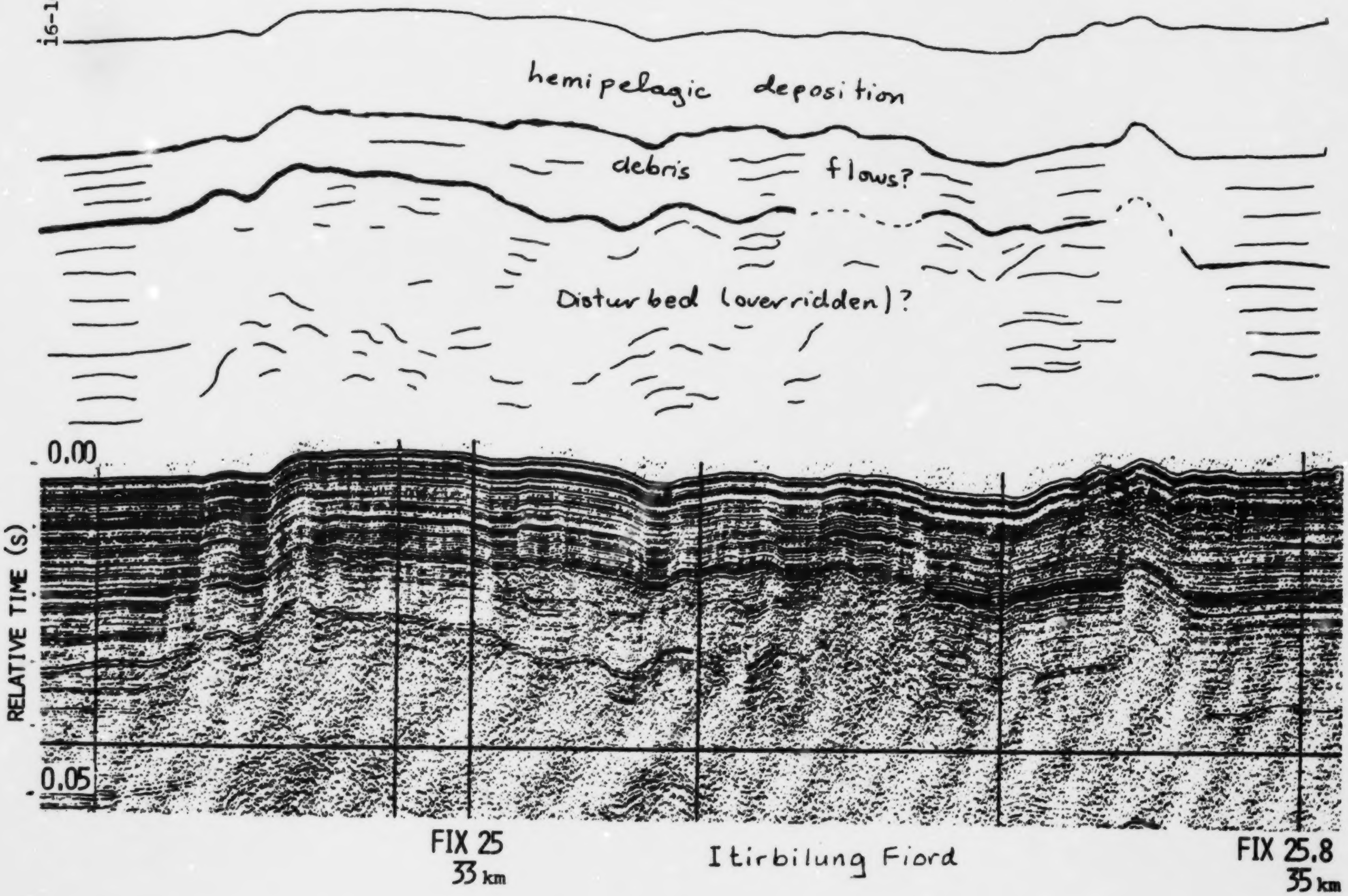

hemipelagic deposition
debris flows?
Disturbed (overridden)?
0.00
RELATIVE TIME (s)
0.05
FIX 25
33 km
Itirbilung Fiord
FIX 25.8
35 km

Figure 16.13

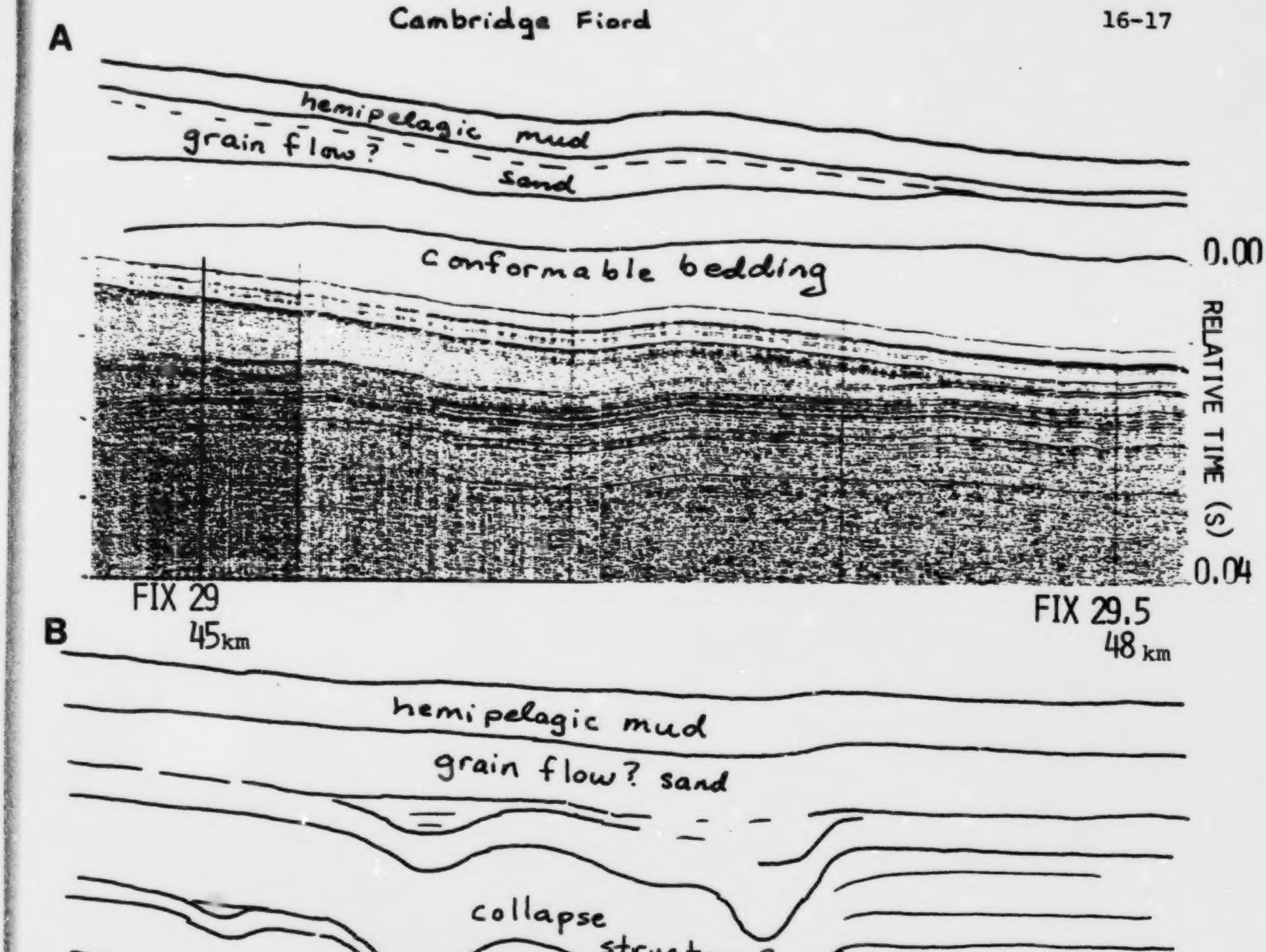

Cambridge Fiord
A
hemipelagic mud
grain flow?
sand
conformable bedding
0.00
RELATIVE TIME (s)
0.04
FIX 29
45km
FIX 29.5
48 km
B
hemipelagic mud
grain flow? sand
collapse
structure?
52 km
FIX 31.6
FIX 32
55 km
0.00
RELATIVE TIME (s)
0.05

Figure 16.14

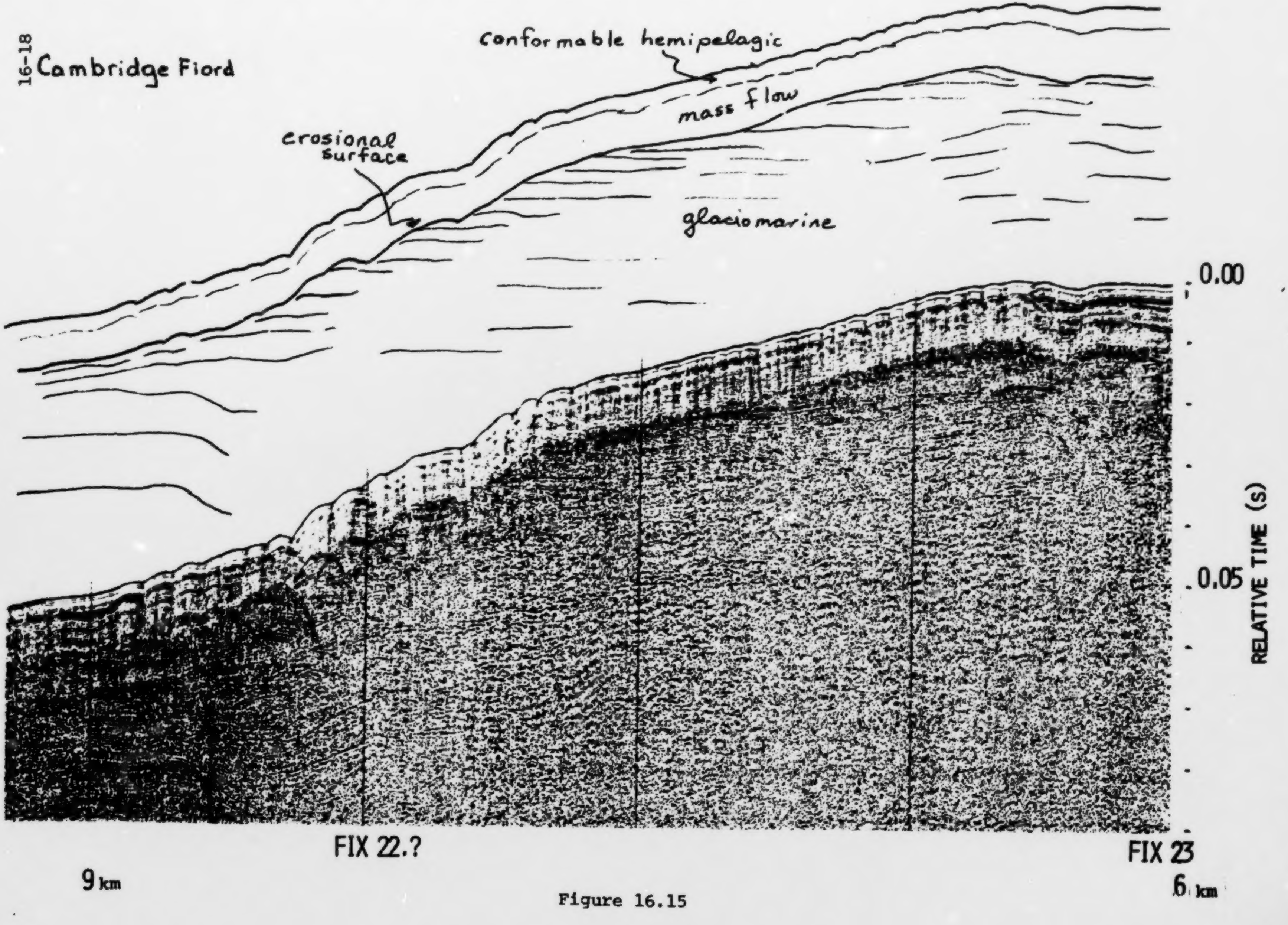
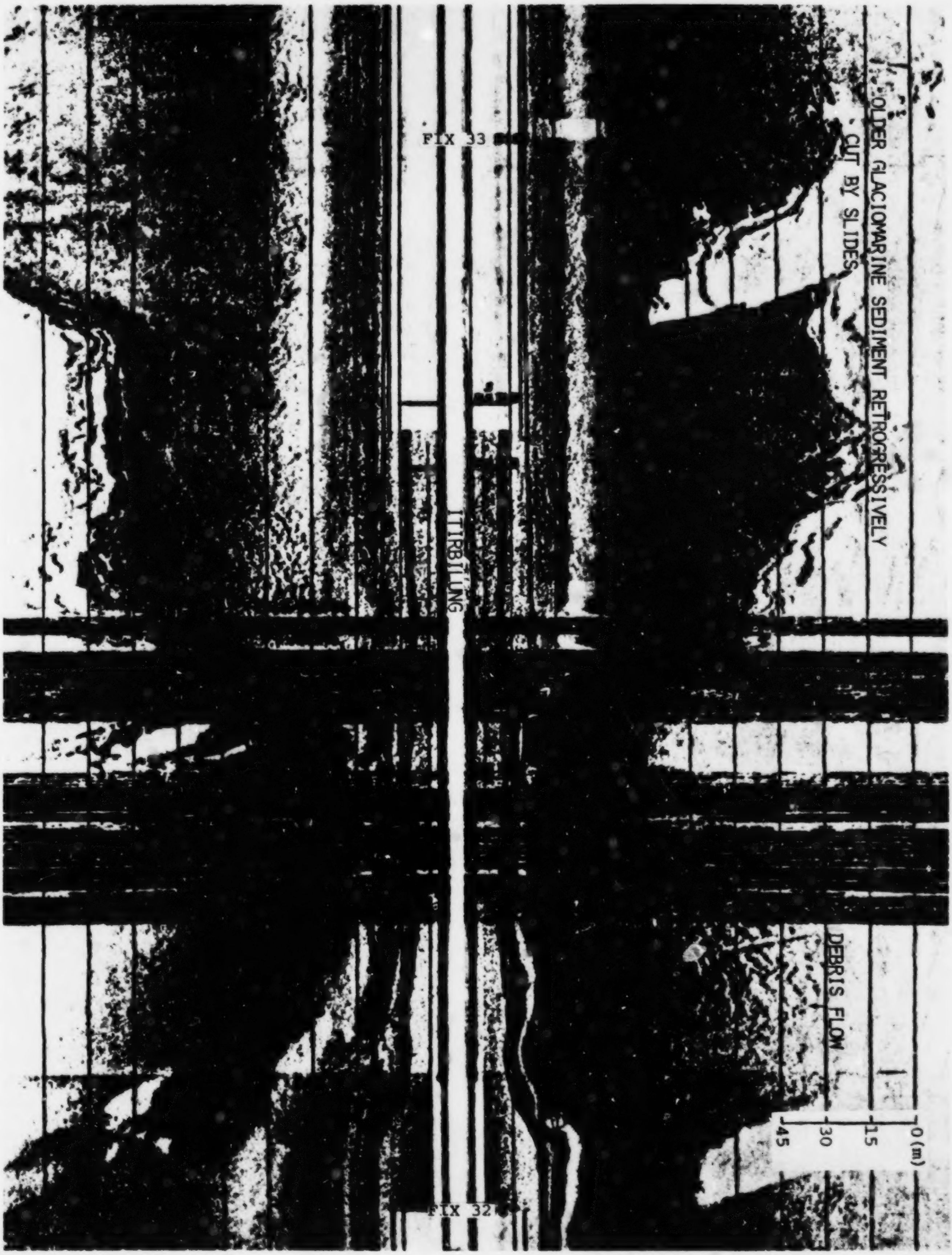

16-18
Cambridge Fiord
conformable hemipelagic
mass flow
erosional surface
glaciomarine
0.00
0.05
RELATIVE TIME (s)
FIX 22.?
FIX 23
9 km
6 km

Figure 16.15


OLDER GLACIOMARINE SEDIMENT RETROGRESSIVELY
CUT BY SLIDES
FIX 33
ITIRBILLUNG
DEBRIS FLOW
0 (m)
15
30
45
FIX 32

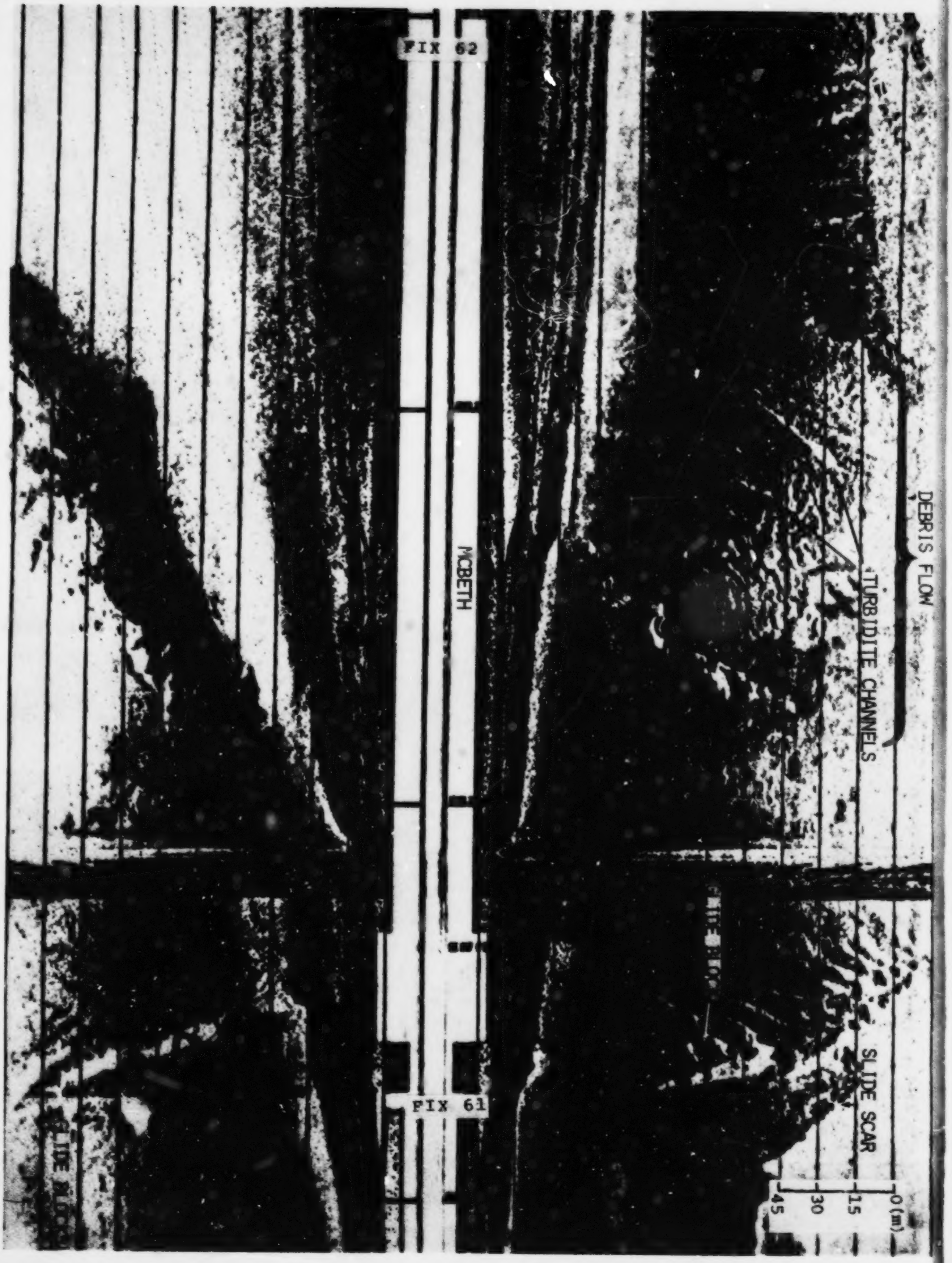

FIX 62
FIX 61
MCBETH
DEBRIS FLOW
TURBIDITE CHANNELS
SLIDE SCAR
SLIDE BLOCK
45
30
15
0(m)

Figure 16.17

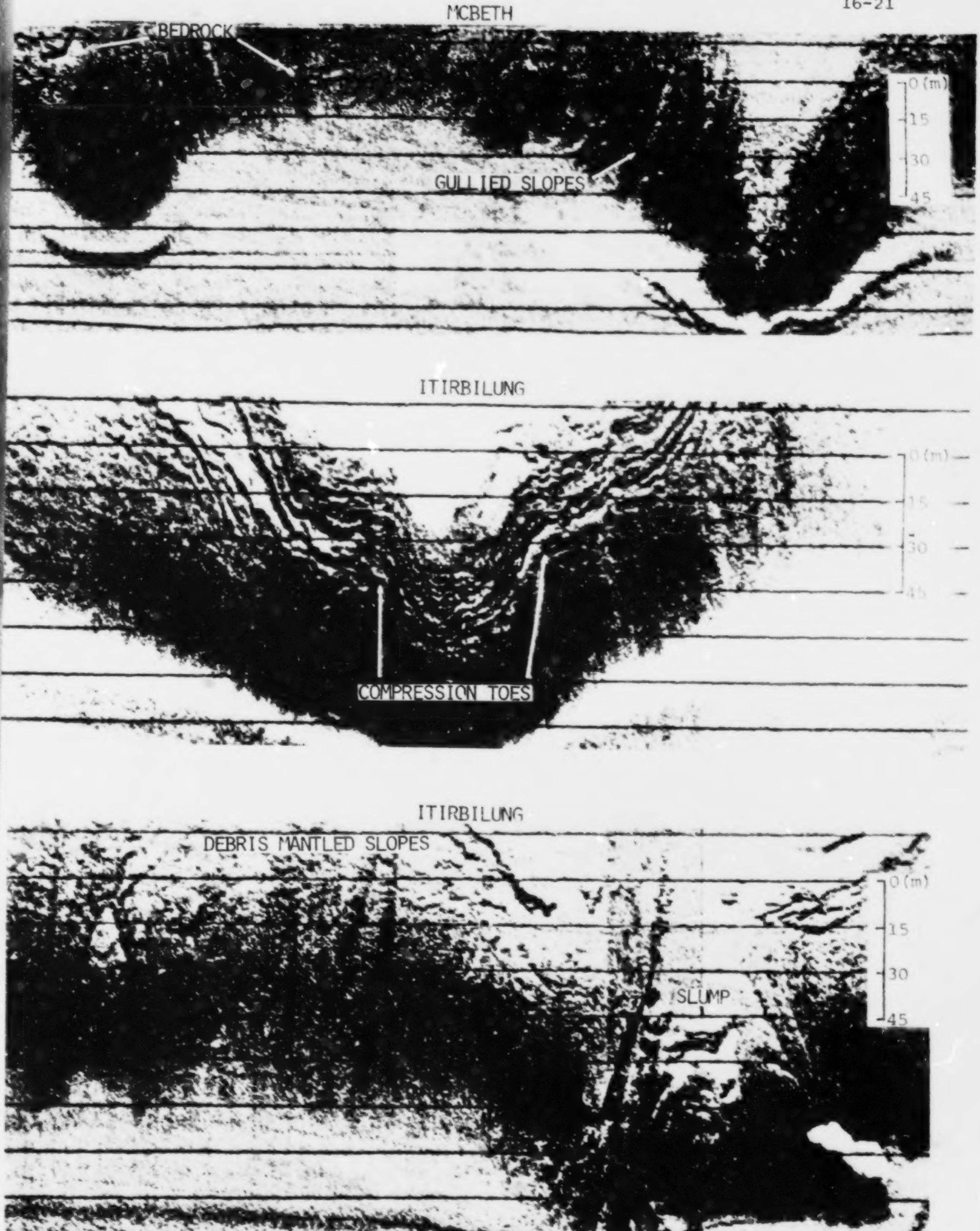

MCBETH
BEDROCK
GULLIED SLOPES
0 (m)
15
30
45
ITIRBILUNG
0 (m)
15
30
45
COMPRESSION TOES
ITIRBILUNG
DEBRIS MANTLED SLOPES
0 (m)
15
30
45
SLUMP
SUBAQUEOUS FANGLOMERATE

Figure 16.18

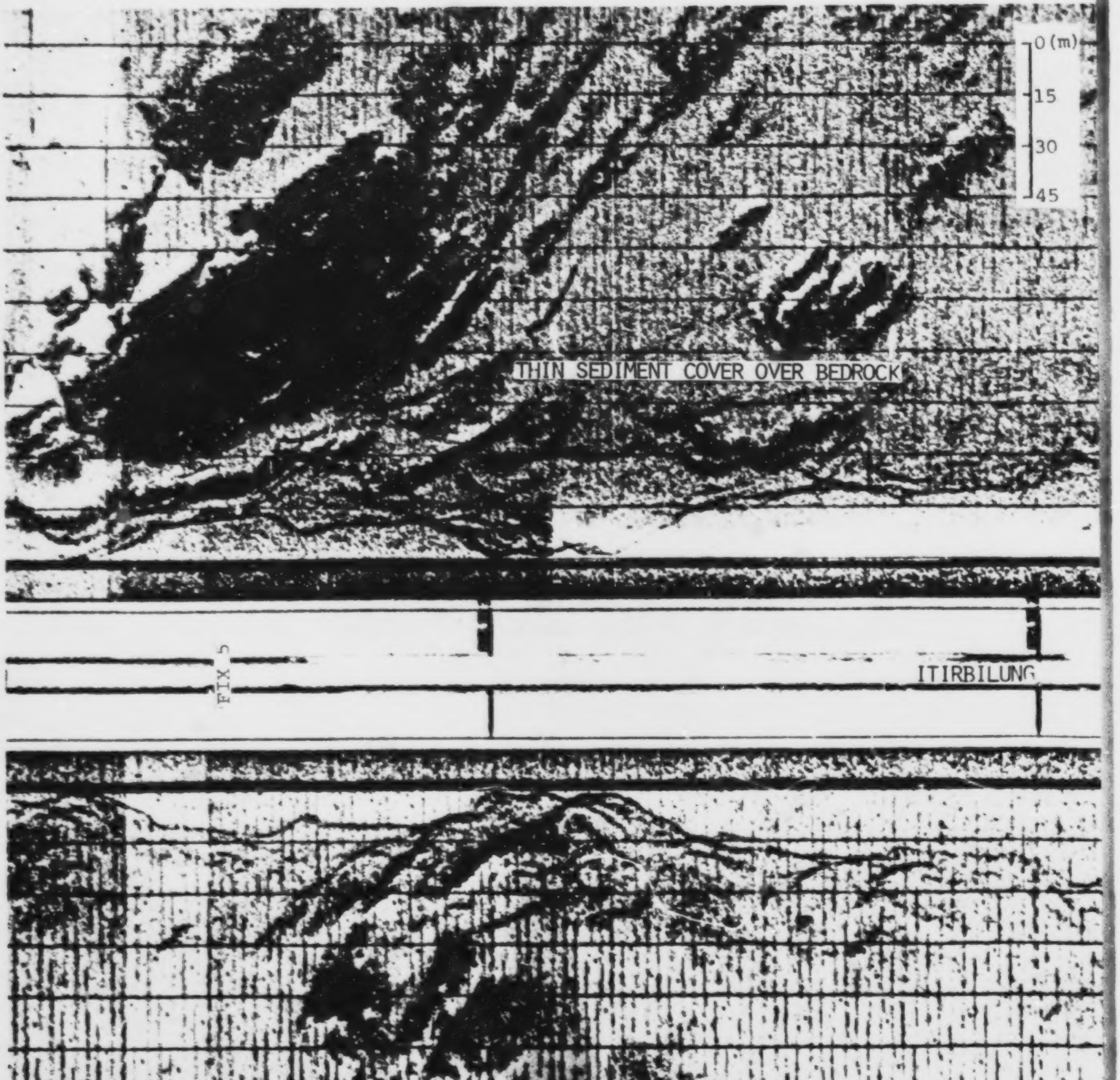

0 (m)
15
30
45
THIN SEDIMENT COVER OVER BEDROCK
FIX 5
ITIRBILUNG

Figure 16.19

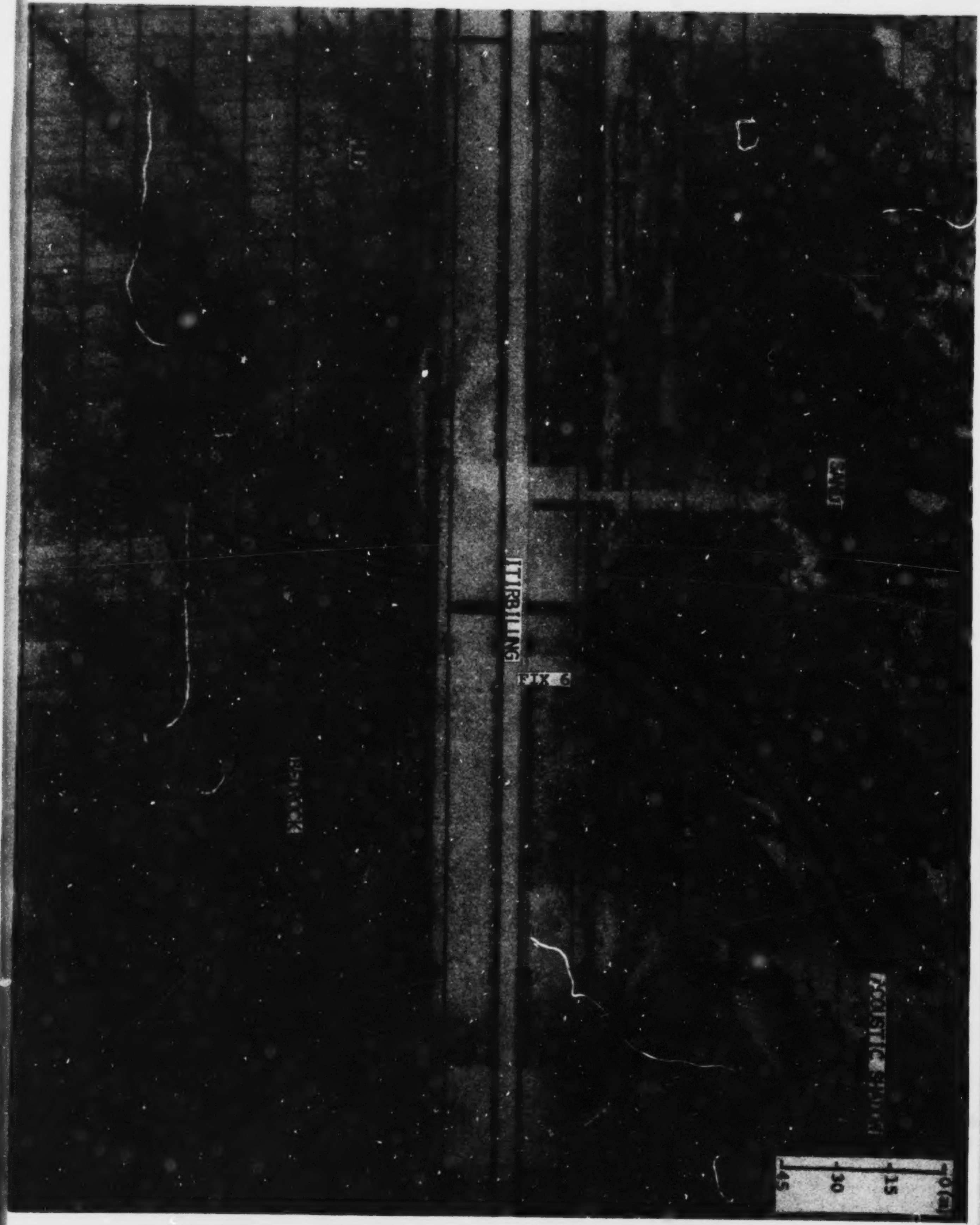
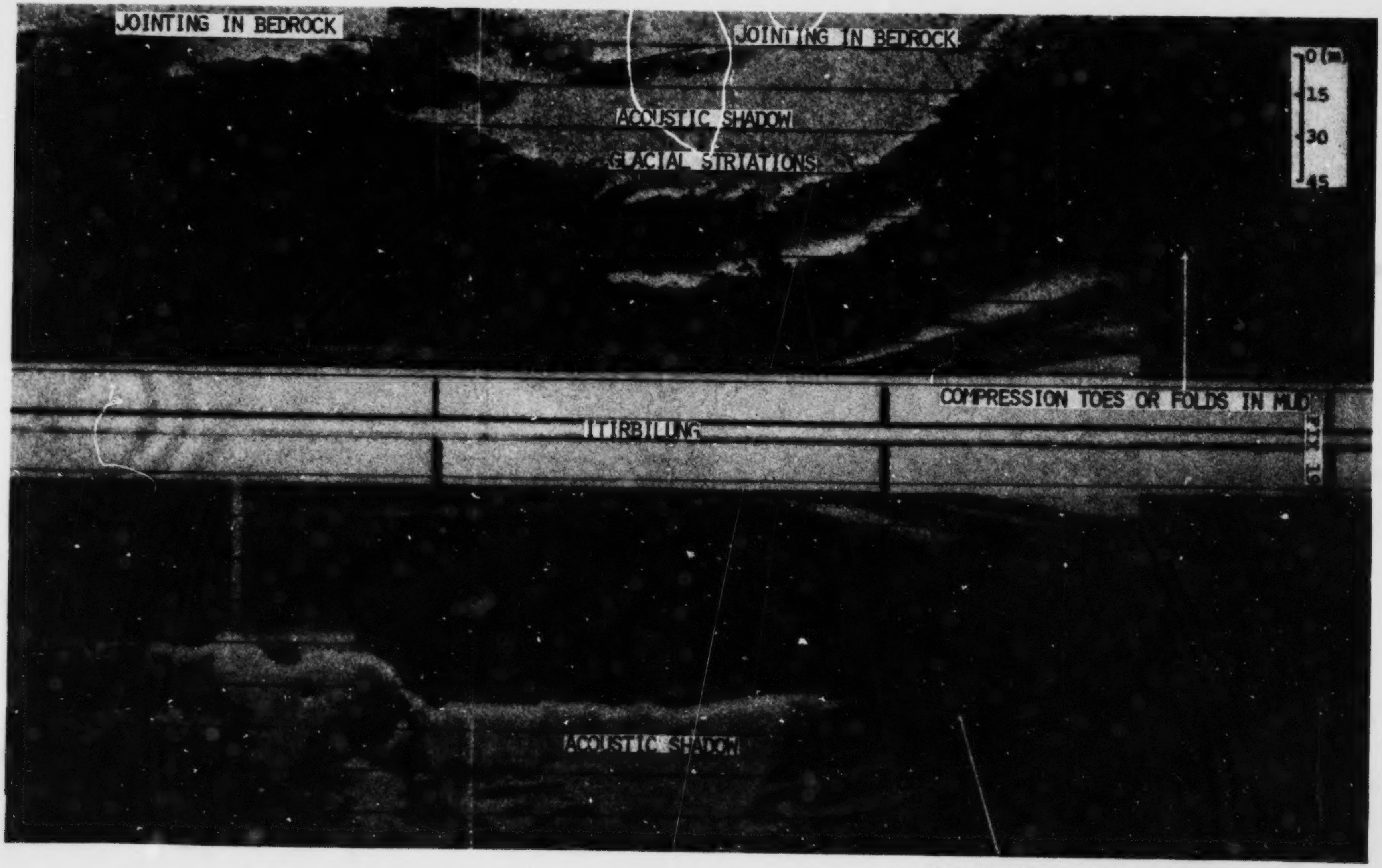
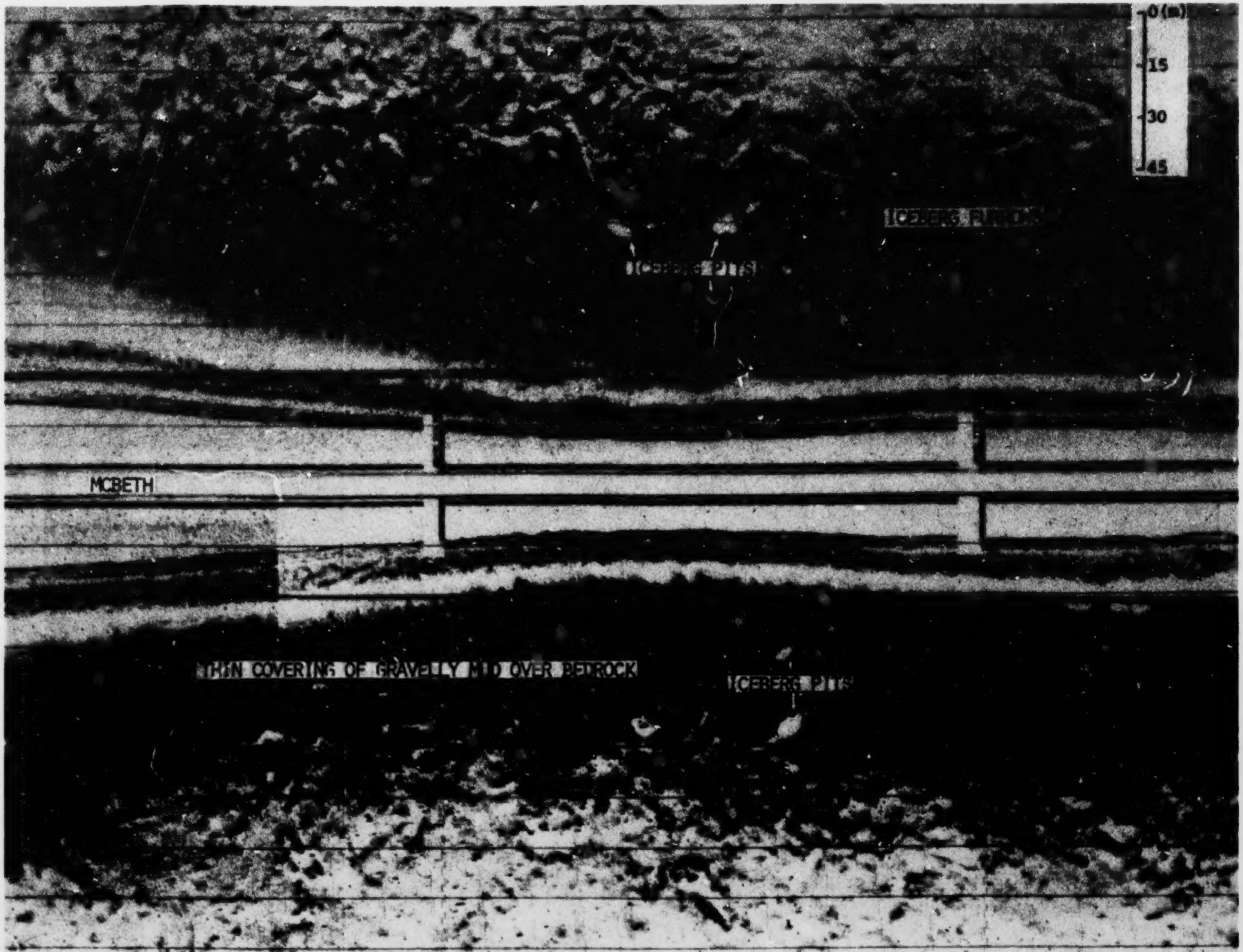


Figure 16.20



MUD DRAPE OVER FOLDED BEDROCK

Figure 16.21


0(m)
15
30
45
ICEBERG FURROWS
ICEBERG PITS
MCBETH
THIN COVERING OF GRAVELLY MUD OVER BEDROCK
ICEBERG PITS

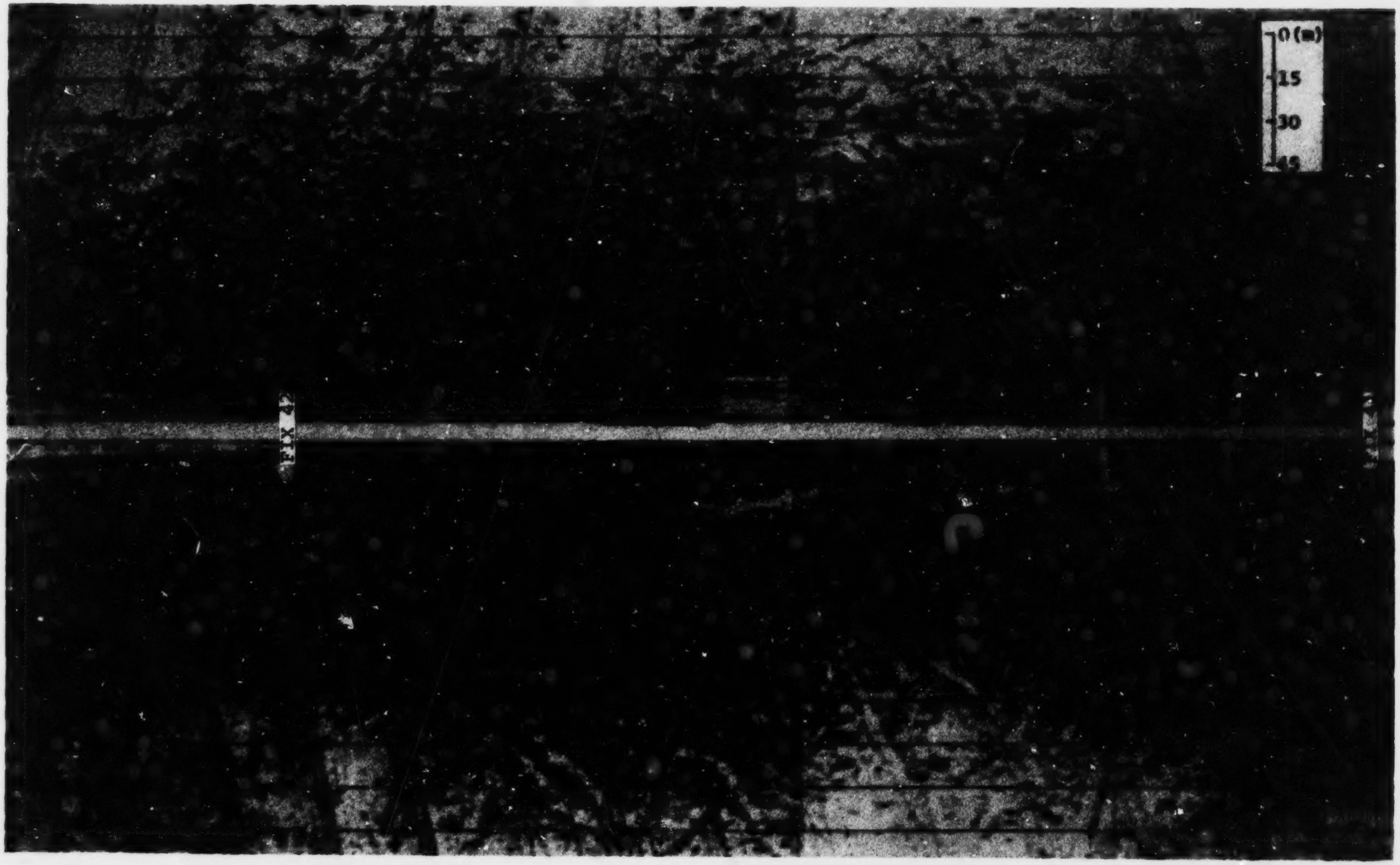


Figure 16.23

CHAPTER 17

SAFE: 1983 BAYHEAD PRODELTA INVESTIGATIONS

BY

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Objectives:

1. To investigate the interaction between fjord-head delta of sandur and the nearshore prodelta region--a zone of high rates of sedimentation and slope instability.

2. To delineate the various types of subaqueous slope failures, their cause (release mechanism) and their products.

3. To document the relationship between foram distribution and environmental conditions.

Methods: The launch GREBE deployed a Klein 421T sidescan sonar: the analog signal was recorded on paper and on a Racal Store 4DS-FM recorder. Scale lines on all sonograms are 15m wide, independent of the range setting. Swath width normally covered 600m. The sonar resonant frequency used was 100kHz with a 20kHz band width and beam width of 1° horizontal and 40° vertical. A Ross acoustic profiler, with a transducer resonant frequency of 192kHz, band width of 18kHz and beam width of 2.6°, provided the accompanying echogram. The positioning was from 3 point RADAR triangulation. Track lines are shown on Fig 17.1 to 17.3.

Grab samples were collected from a Boston Whaler using a small stainless steel Eckman dredge, and from either of the two launches (GREBE and SHOVELLER) with a Van Veen grab sampler. Samples were divided into a faunal sample and a sediment sample. The former was pickled with formalin (pH = 8.3).

All of the grab samples were analyzed for their size frequency distributions. The gravel fraction was separated from the finer fraction using a standard 2mm sieve. If the gravel fraction was greater than 10%, the fraction was sieved used standard ASTM ¼ϕ sieves. The sand fraction was analyzed for its equivalent spherical sedimentation diameter at $^{1}/_{5}\phi$ interval using the computerized AGC setting tube. The mud fraction was analyzed on computerized Sedigraph ® 5000D for the particles equivalent spherical sedimentation diameters at 1/5Ø interval. The fraction distributions were meshed with program merge and log-log histograms and cumulative log-probability plots produced. Statistics were calculated by the method of movements.

Some of the grab samples were sub-sampled for total carbon determinations. Previous testing (see chapter 7 this volume or SAFE data report vol. 1) had demonstrated that little quantitative variation existed between total carbon and organic carbon. Samples were analyzed on a Leco model WR-12 Carbon Determinator equipped with a LECON INDUCTION furnace. The instrument is calibrated using a 1 gram iron ring reference standard.

Foram methods and results are provided together with HUDSON grab samples in Chapter 7 of this report.

The Canadian Navy's unmanned submersible "dart" was employed from the launch SHOVELLER on the Itirbilung prodelta. The submersible sank to a depth of 50m and surveyed a 0.5 km transect down to a depth of 140m (Fig. 1). Notes were taken based on a television surface monitor.

Using a jet ranger PCSP helicopter, moorings and weather stations were set up in Cambridge and Itirbilung Fiords. The moorings were laid out and assembled on the delta flats and deployed via helicopter at the 50m isobath offshore of the river mouth. The 50m isobath was located with a surface read-out digital echosounder slung from the helicopter and marked with a R. Gilbert (Queen's Univ) sediment trap and surface buoy. Figure 17.4 gives the mooring schematic and equipment used. Two Aanderaa weather stations were then set up on each delta as shown in Figure 17.5C. The current meters, thermistor chain and weather stations were cycled and recorded every 10 minutes on magnetic tape. Data presented in Figures 17.1 to 17.20 have been 0.5 hour filtered then averaged over 1 hour.

RESULTS

Dart Submersible Dive on Itirbilung Prodelta

The submersible landed on the seafloor in a sandy channel (large mica reflections). There were were only remnants of ripples with an apparent surface dusting of organic-like mud. It is this material that is probably easily resuspended. Benthos was dominated by ophiourids between 1 to $3m^{-2}$ with snake blennys and eel ponts (?) that were mostly burried but swam up upon agitation. Amphipods 1 to 3 m^{-2} were in greatest densities in shallower water and seemed to fluctuate spatially. Fucus was occasionally found on the bottom. Brittle stars occasionally reached concentrations of 5 to $10m^{-2}$ especially near occasional ice-rafted boulders (to take advantge of local increase in turbulence). Amphipod and shrimp concentrations reached $50m^{-2}$, some on the bottom, most just off the bottom and lined up into the dominent current. Ripples varied in dimension down the channel from vague forms to well-developed straight crested ripples with asymmetry indicatng down channel development (= 10 to 30cm, h = 1 to 4 cm). These ripples were delineated with heavy minerals on stoss and coarser lights on lee of ripples. In deeper water, ripples were found on the tops of larger megaripples whose wavelengths were $\approx$3 to 4 m. These ripple had mostly coarser sand. Shrimp were mostly observed on the flat sections of the channel rather than on the megaripples; some areas had flat-bed bedforms indicating a highly turbulent regime. These areas extended many tens of meters before going back into a rippled seafloor. Some shrimp were very large indicating at least two species.

One cutback at the edge of the channel had exposed muddy varves? that were being actively eroded with mud clasts being deposited in the channel margins and partly buried by sand transport down-channel. The cutbank was $\approx$0.8 to 1.2 m high with approximately 20 to 25 varves being exposed. The channel levees were poorly developed but present, and consisted of rippled sand merging into the "flood-plain" or interchannel mud. These areas were mostly fine-grained with a completely different fauna. Polychaete worm tubes protruded 10 to 30 cm from the seafloor increasing in density away from the channel levee (from naught to $60m^{-2}$). The tubes alternated with brittle stars in dominance. Infaunal evidence (burrowing shrimp substituting for mobile shrimp) were in the forms of mounds (with 2cm openings) and fecal debris.

Grab Sample Texture: (Table 17.1, Figures 17.21 to 17.53)

The Keel River prodelta is composed primarily of silty sand and sandy silt in the size range of medium to very fine sand ($\bar{x}$ of 1.12ϕ to 4.93ϕ) with moderate to poor sorting ($\sigma = 1.16\phi$ to 2.22ϕ): the clay content is low (0.55% to 9.7%). The Cambridge River prodelta is very different texturally being mostly coarser grained ($\bar{x} = -2.66\phi$ to 6.00ϕ) and extremely poorly sorted ($\sigma = 2.08\phi$ to 4.80ϕ). Four of these samples had greater than 50% gravel. The McBeth prodelta again showed unique textural differences with samples being mostly muddy with high clay contents (up to 50%). The sorting values range from $\sigma = 1.29\phi$ to 3.01ϕ. The Itirbilung prodelta is texturally similar to the Keel River prodelta with samples being silty sands or sandy silts ($\bar{x} = 3.05\phi$ to 5.45ϕ) and moderately poorly sorted ($\sigma = 1.34\phi$ to 2.55ϕ).

Carbon: (Table 17.2)

The lowest carbon values are from the ice dominated Itirbilung prodelta (0.18% to 0.46%). The Keel River and Cambridge River prodeltas had the highest carbon values, 1.21% and 1.22% respectively. The carbon values of the McBeth prodelta showed little variation (0.4 to 0.8%).

Seafloor Morphology

The waste clarity during the late summer - early fall is very high and allowed helicopter-based photo-transects to document delta-front features. Three examples are shown in Figure 17.5. In Figure 17.5A note two collision-induced slumps where sediment has flowed a short distance downslope. Both Figure 17.5A and B are from the Keel River delta where markings appear to be dominated by ice push and scour features. These features are notably absent in the Itirbilung and McBeth delta fronts. This may relate to the more active progradation along its entire front; such ice scour features from the previous season may have been burried under the progradation of delta front. The dominant feature for the Itirbilung and McBeth delta fronts are numerous chutes (Fig. 17.5D) that may be simple or complex chutes within chutes. The chute widths range from a few metres to 15 metres. The chutes are separated from each other by a sharp crested ridge. The chutes are considered entirely erosional features and in the case of Itirbilung prodelta merge downslope of the forsets to develop into channels. These channels are both erosional and depositional in nature. They are found to erode into the hemipelagic mud and transport and deposit sand some seven kilometres downslope from the delta front (Fig. 17.7). The channels are seldom more than 70m wide and 5m deep; the channel width and depth decreases downslope until the channel form disappears. The channels have low sinuosity values but may converge with one another or truncate one another (Fig. 17.8). The channels contain dense and well-sorted sand many times floored with megaripples with crests perpendicular to the channel axis (Fig. 17.8, 17.9). Not all the channels appear active and some are presently covered with a mud drape (Fig. 17.9). The fjord side-walls within the Itirbilung prodelta region show both slumping due both to sediment overloading and oversteepening as well as rock avalanche material (Fig. 17.10). High resolution HUNTEC DTS seismic records for the Itirbilung prodelta reveal four distinct units (Fig. 17.7). The lowest unit is tentatively described as a proximal glaciomacine unit: internally stratified and conformable yet not conformable to the overlying unit. That unit appears to represent the prograding prodelta fed both from the main fjord sandur as well as from the main fjord sandur as well as from a nearby side-entry glacier. The third unit appears to represent gravity flows up-fjord from the side-entry glacier overlain by a large slide pile from the sandur direction. The surficial unit represents the coalescing channels of sand that erode into the hemipelagic muds and eventually grade into basin turbidites.

The McBeth prodelta is dominated by a major slide (Fig 17.6). High resolution HUNTEC DTS seismic profiles reveal two major lysteric slide planes with down throws of 10m and 13m respectively. Slide blocks show evidence of compression at the slide toe with noticeable folds and possibly antithetic thrust faults. The slide surface appears remolded and cut by a megachannel of unknown origin. The slide surface has also been disturbed by debris piles from the sidewalls.

Weather Station and Mooring Data: (Fig. 17.11 to 17.20)

Both Itirbilung and Cambridge fjords had a number of up and down fjord wind events, reaching maximum velocities of 36 and 25 km h^{-1}, respectively for each fjord. The large events were correlateable between the two fjords, indicative of large weather systems. The Cambridge system has a relatively strong land-sea breeze component to its wind pattern. Itirbilung Fiord is more influenced by Katabatic winds as a result of its hinterland icefields.

Invariably, the current velocity at 6m water depth showed a strong response only to the up-inlet wind events. In Itirbilung Fiord, these 6m currents reached speeds between 0.2 to 0.4 m s^{-1}. In Cambridge Fiord, these currents seldom reach 0.12 m s^{-1}. There is both a complex oscillation up and down inlet (although the wind blows up-inlet only) as well as a strong cross-fjord component.

In Itirbilung Fiord, up-inlet winds bring warm water up-fjord, an affect that is evident to a depth of 41m. After the wind event ends, an internal seiche is set up whose period is equal to the diurnal tide. This can be seen in the fluctuation in water temperature but not current velocity. Two down-inlet wind events dissipated the internal seiche thus stabilizing the water column. The currents at the 41m water depth varied linearly with the 6m currents but were extremely weak.

Down-inlet winds introduce upwelling near the fjord-head and results in colder waters. The mooring in Cambridge Fiord was off the Keel River in a side-entry fjord separated from the main system by a sill (maximum depth unknown but ≈25m). Thermistor chain results indicate both internal seiche * slow deep-water exchange events. The current speed at 41m was nearly non-existent, however.

Table 17.1

		SIZE FRACTIONS (%)					MOMENT STATISTICS (ϕ)			
Sample	ID	Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
[illegible]										
CA-1	2063	1.40	66.15	32.45	28.75	3.70	3.26	2.32	0.44	3.51
CA-2	2064	0.20	93.48	6.32	5.65	0.67	2.68	1.16	1.39	14.17
CA-3	2065	6.00	92.90	1.10	0.55	0.55	1.12	1.46	-0.08	9.36
CA-4	2066	1.60	93.18	5.22	4.53	0.69	1.80	1.51	0.93	8.61
CA-5	2067	2.10	88.21	9.69	7.66	2.03	1.97	1.96	1.33	7.47
CA-6	2068	3.80	86.15	10.05	7.71	2.34	2.40	2.07	0.63	7.10
CA-7	2069	0.20	93.36	6.44	5.88	0.56	1.71	1.40	1.79	8.42
CA-9	2070	0.30	77.66	22.04	19.40	2.64	3.34	1.70	1.30	6.90
CA-10	2071	1.30	90.50	8.20	7.20	1.00	2.07	1.60	1.05	7.61
CA-11	2072	0.50	91.04	8.46	7.39	1.07	2.43	1.45	1.60	10.84
SHOVELLER										
CA-1	2082	16.76	48.97	34.26	27.70	6.56	2.53	3.55	0.16	2.50
CA-2	2083	33.01	34.21	32.78	22.75	10.03	1.88	4.28	-0.31	2.11
CA-3	2084	27.81	23.22	48.96	33.05	15.91	3.00	4.80	-0.06	1.80
CA-4	2085	26.26	41.07	32.67	24.74	7.93	1.97	3.94	0.31	2.17
CA-5	2086	7.90	53.17	38.93	30.25	8.67	3.80	3.07	0.02	3.85
CA-6	2087	63.88	21.43	14.69	8.67	6.02	-0.49	3.90	1.42	3.89
CA-7	2088	2.80	63.62	33.58	22.66	10.92	3.62	3.05	0.76	3.40
CA-8	2089	89.11	6.74	4.15	2.64	1.51	-2.66	2.58	2.98	12.11
CA-9	2090	76.00	23.48	0.52	0.27	0.25	-2.11	1.67	2.00	8.48
CA-10	2091	31.60	49.11	19.29	12.89	6.40	0.95	4.05	0.34	2.49
CA-11	2092	0.10	47.03	52.87	40.07	12.80	4.73	2.58	0.46	2.30
CA-12	2093	0.00	18.41	81.59	64.26	17.33	6.00	2.08	-0.08	2.70
CA-13	2094	49.62	30.34	20.04	11.11	8.93	0.53	4.17	1.05	3.12
GREBE										
CA-1	2095	0.50	82.25	17.25	15.16	2.09	2.69	1.86	1.15	5.63
CA-2	2096	0.00	64.24	35.76	31.12	4.64	3.57	2.22	0.84	3.03
CA-3	2097	0.10	90.57	9.53	8.28	1.05	2.60	1.31	2.12	11.07
CA-4	2098	0.30	75.97	23.73	21.52	2.21	3.29	1.65	1.08	5.59
CA-5	2099	0.00	43.72	56.28	51.07	5.21	4.63	1.79	0.52	2.98
CA-6A	2100	0.00	46.68	53.32	49.25	4.07	4.31	2.02	0.19	2.34
CA-6B	2101	0.00	46.67	53.33	45.99	7.34	4.55	2.07	0.54	2.74
CA-7	2102	0.00	55.39	44.61	40.04	4.57	4.00	2.09	0.52	2.53
CA-8	2103	0.10	62.91	36.99	32.42	4.57	3.75	2.16	0.68	2.98
CA-9	2104	0.10	48.80	51.50	42.67	8.43	4.68	2.00	0.81	3.23
CA-10	2105	0.10	41.67	58.23	48.51	9.72	4.93	1.99	0.66	3.05
CA-11	2106	0.10	38.28	61.62	54.22	7.40	4.87	1.86	0.50	3.43
MC-1	2107	-	3.20	96.80	53.58	43.22	7.74	2.15	-0.12	3.00
MC-2	2108	-	2.69	97.31	48.92	48.39	8.01	2.27	-0.10	2.62
MC-3	2109	0.10	4.18	95.72	54.71	41.01	7.58	2.37	-0.16	3.23
MC-4	2110	-	2.83	97.17	55.69	41.48	7.67	2.18	0.07	2.76
MC-5	2111	-	6.62	93.38	60.54	32.84	7.13	2.22	0.24	2.61

Table 17.1 (Continued)

Sample	ID	SIZE FRACTIONS (%)					MOMENT STATISTICS (ø)			
		Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
MC-6	2112	-	16.66	83.34	56.36	26.98	6.56	2.40	0.53	2.40
MC-7	2113	-	9.96	90.04	58.79	31.25	6.91	2.34	0.27	2.49
MC-8	2114	0.10	53.32	46.58	26.61	19.97	4.97	3.01	0.71	2.30
MC-9	2115	0.10	15.69	84.21	50.85	33.36	6.86	2.69	-0.03	2.48
MC-10	2116	-	5.11	94.89	59.73	35.16	7.29	2.17	0.18	2.54
MC-11	2117	0.35	68.32	31.33	21.14	10.19	3.54	2.91	1.13	3.72
	2118	2.30	95.59	2.11	1.26	0.85	1.16	1.29	1.85	16.40
MC-12	2119	-	42.02	57.98	41.25	16.73	5.32	2.58	1.14	3.31
MC-13	2120	-	32.75	67.25	46.35	20.90	5.83	2.59	0.82	2.63
MC-14	2121	-	27.67	72.33	48.12	24.22	6.14	2.64	0.57	2.34
MC-15	2122	-	5.41	94.59	60.76	33.83	7.17	2.28	0.26	2.56
MC-16	2123	-	4.78	95.22	60.96	34.26	7.29	2.23	0.32	2.52
MC-17	2124	-	7.09	92.91	43.97	48.94	7.87	2.43	-0.43	3.04
MC-18	2125	0.10	2.92	96.98	46.89	50.09	8.03	2.16	-0.44	3.88
MC-19	2126	-	2.48	97.52	49.54	47.98	8.00	2.13	-0.18	3.14
MC-20	2127	0.01	3.41	96.58	48.91	47.67	7.98	2.21	-0.28	3.34
MC-21	2128	-	80.99	19.01	15.41	3.60	3.34	1.75	2.43	9.92
MC-22	2129	-	35.47	64.53	55.62	8.91	5.05	1.88	1.48	5.04
MC-23	2130	-	9.85	91.05	64.45	26.60	6.74	2.25	0.43	2.75
IT-1	2074	-	70.87	29.13	24.42	4.71	4.02	1.70	2.38	9.14
-1B	2075	-	54.40	45.60	35.93	9.67	4.68	2.13	1.48	4.75
-2	2076	0.30	44.64	35.06	43.05	12.01	4.86	2.55	0.78	3.53
-2B	2077	0.40	90.83	8.77	7.11	1.66	3.05	1.34	2.39	17.42
-3	2078	-	52.18	47.82	39.64	8.19	4.60	2.07	1.47	5.02
-4	2079	-	45.94	54.06	41.70	12.36	5.01	2.30	1.23	3.89
-5	2080	-	40.63	59.37	42.49	16.88	5.45	2.47	1.02	3.11
-6	2081	-	69.85	30.15	24.40	5.75	3.88	2.00	1.86	6.82

TABLE 17.2 TOTAL CARBON

Cambridge Fiord

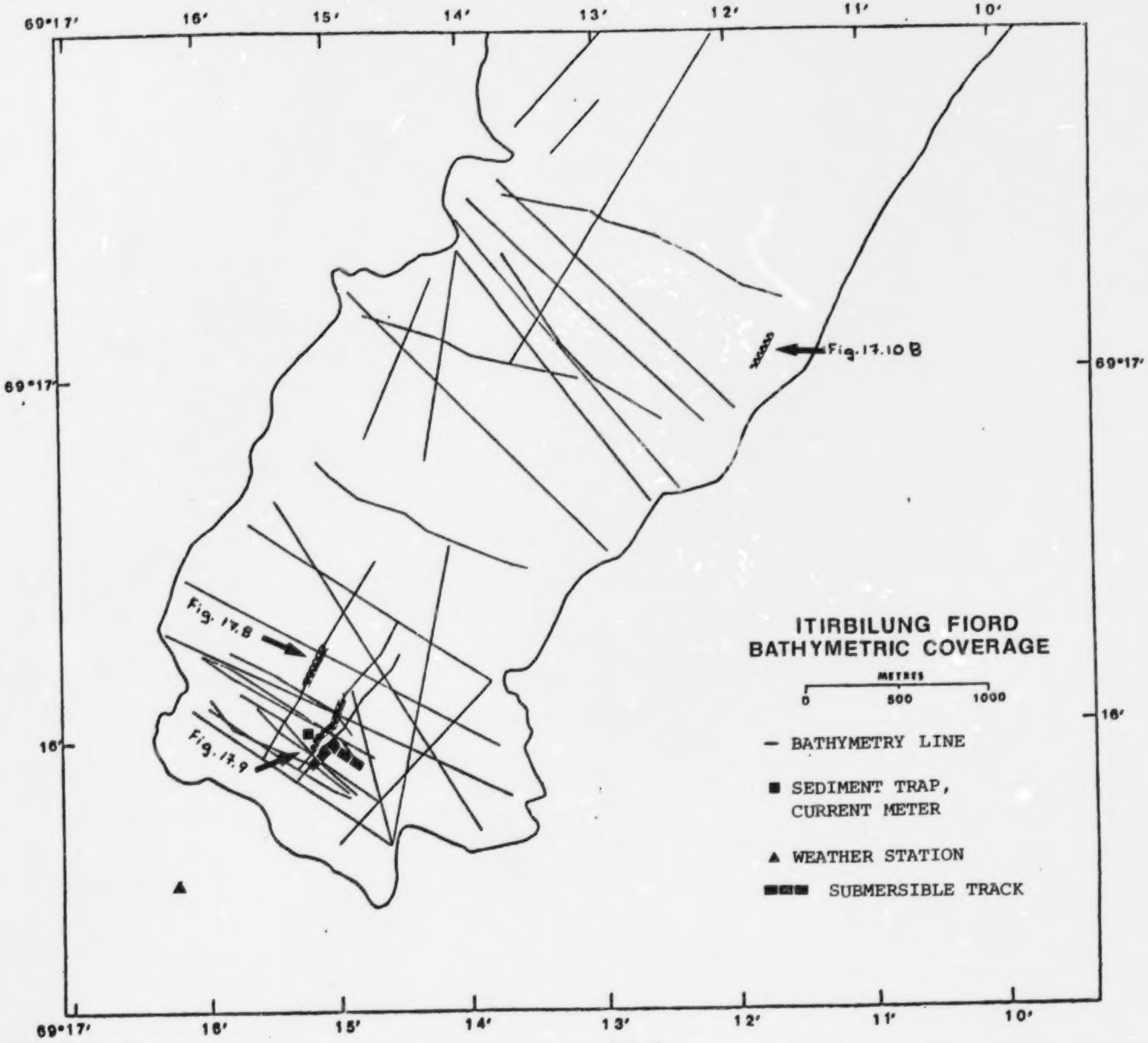
Boston Whaler	(%)	GREBE	(%)	Shoveller	(%)
CA-1	0.37	CA-3	0.23	CA-1	0.31
CA-4	0.25	CA-6A	1.21	CA-3	0.71
CA-5	0.80	CA-6B	0.87	CA-4	1.22
CA-6	0.14	CA-11	0.48	CA-7	0.38
				CA-8	--
				CA-12	0.44
				CA-13	0.66

Itirbilung Fiord

Grebe	(%)	SHOVELLER	(%)
IT-14	0.18	IT-2	0.24
IT-15	0.46	IT-3	0.46
		IT-4	0.38
		IT-5	0.45
		IT-6	0.34

McBeth Fiord

Shoveller	(%)		(%)
MC-1	0.68	MC-13	0.63
MC-2	0.62	MC-14	0.50
MC-3	0.60	MC-15	0.60
MC-4	0.60	MC-16	0.57
MC-5	0.58	MC-17	0.71
MC-6	0.52	MC-18	0.78
MC-7	0.58	MC-19	0.68
MC-8	0.45	MC-20	0.69
MC-9	0.52	MC-21	0.20
MC-11	0.42	MC-23	0.55
MC-12	0.44		


ITIRBILUNG FIORD
BATHYMETRIC COVERAGE
METRES
0
500
1000
BATHYMETRY LINE
SEDIMENT TRAP, CURRENT METER
WEATHER STATION
SUBMERSIBLE TRACK
Fig. 17.8
Fig. 17.9
Fig. 17.10 B
69°17′
16′
15′
14′
13′
12′
11′
10′

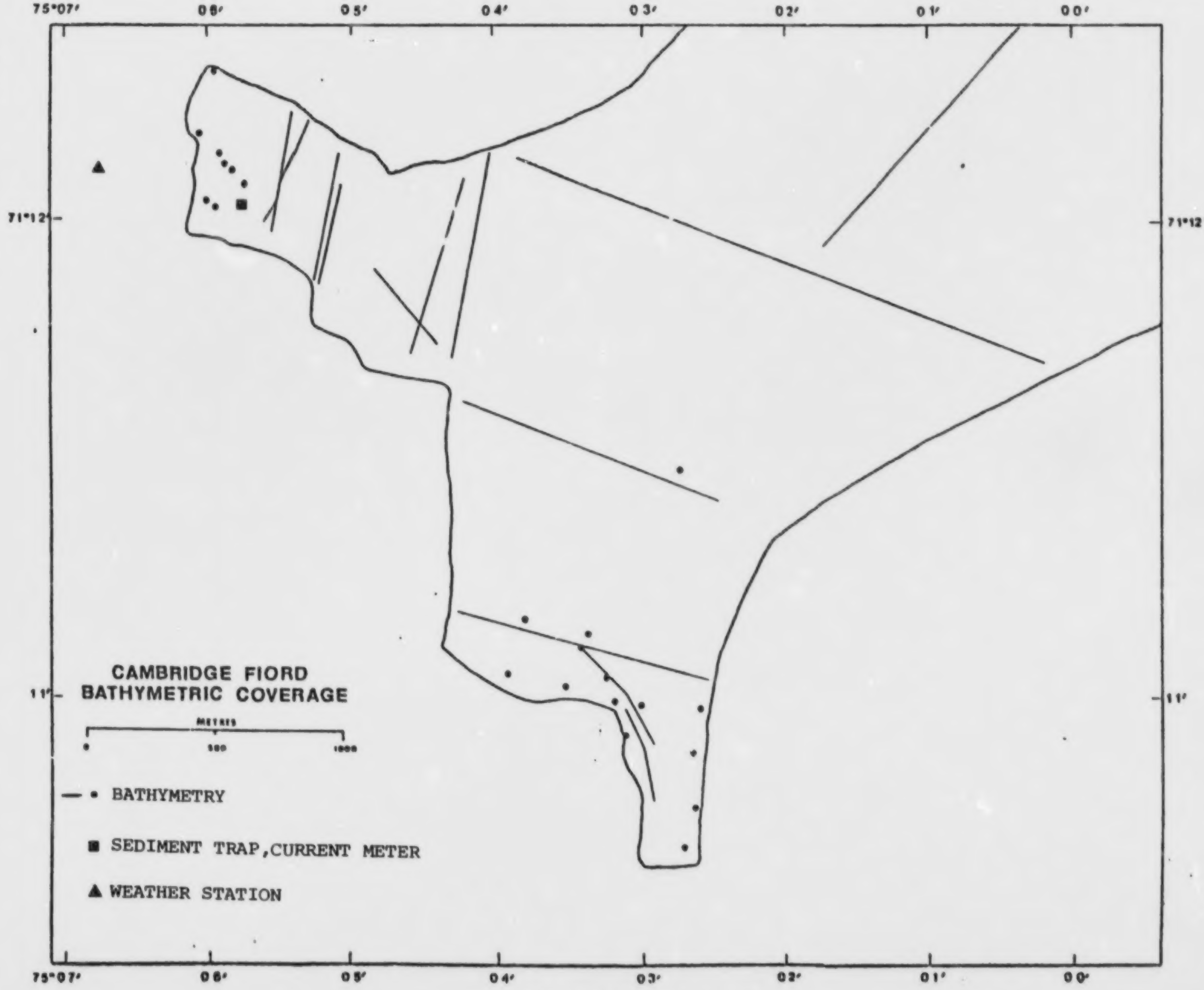
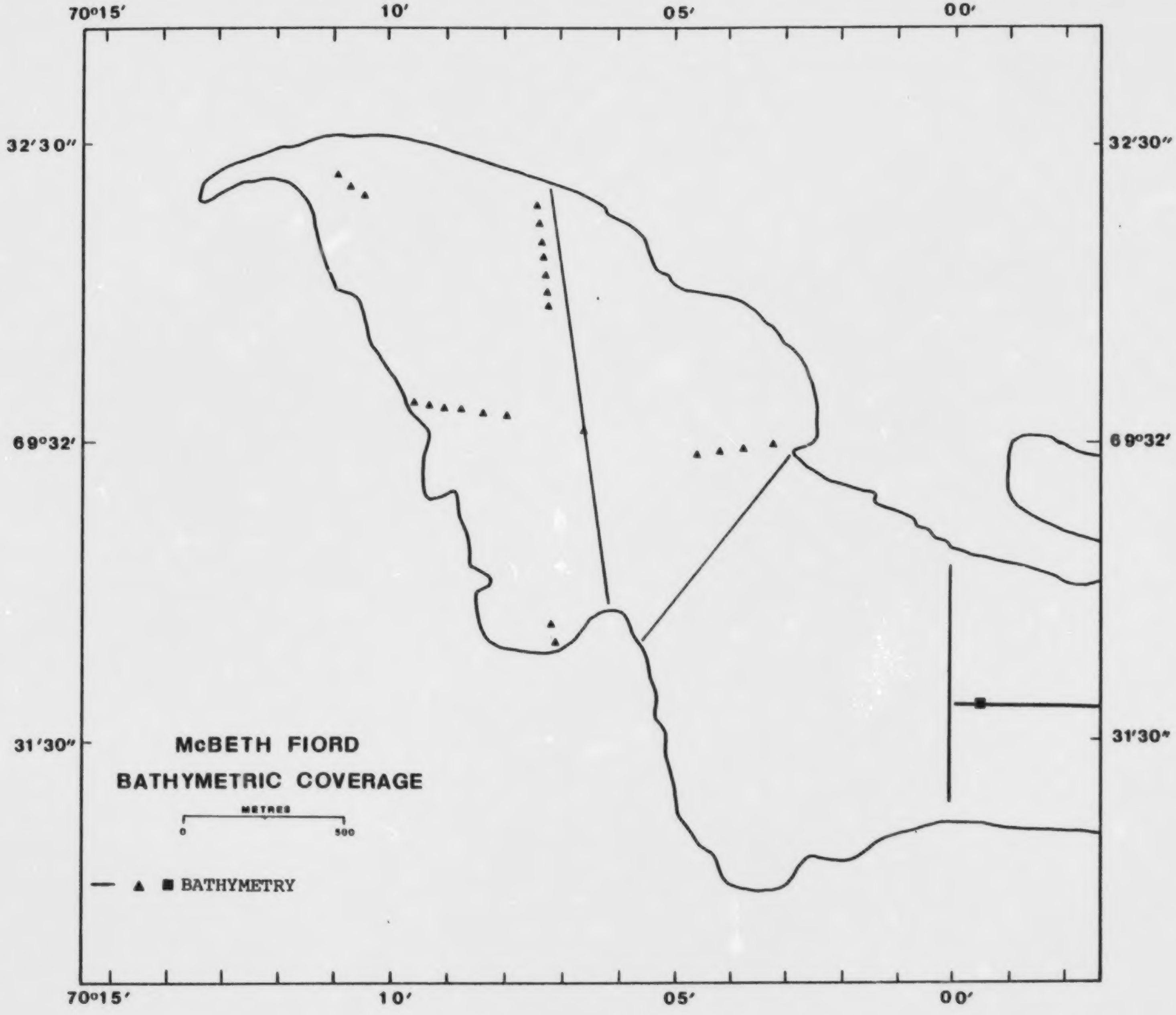

75°07′
06′
05′
04′
03′
02′
01′
00′
71°12′
11′
CAMBRIDGE FIORD
BATHYMETRIC COVERAGE
METRES
0
500
1000
— • BATHYMETRY
■ SEDIMENT TRAP,CURRENT METER
▲ WEATHER STATION

Figure 17.2



McBETH FIORD
BATHYMETRIC COVERAGE

HELICOPTER DEPLOYED MOORINGS

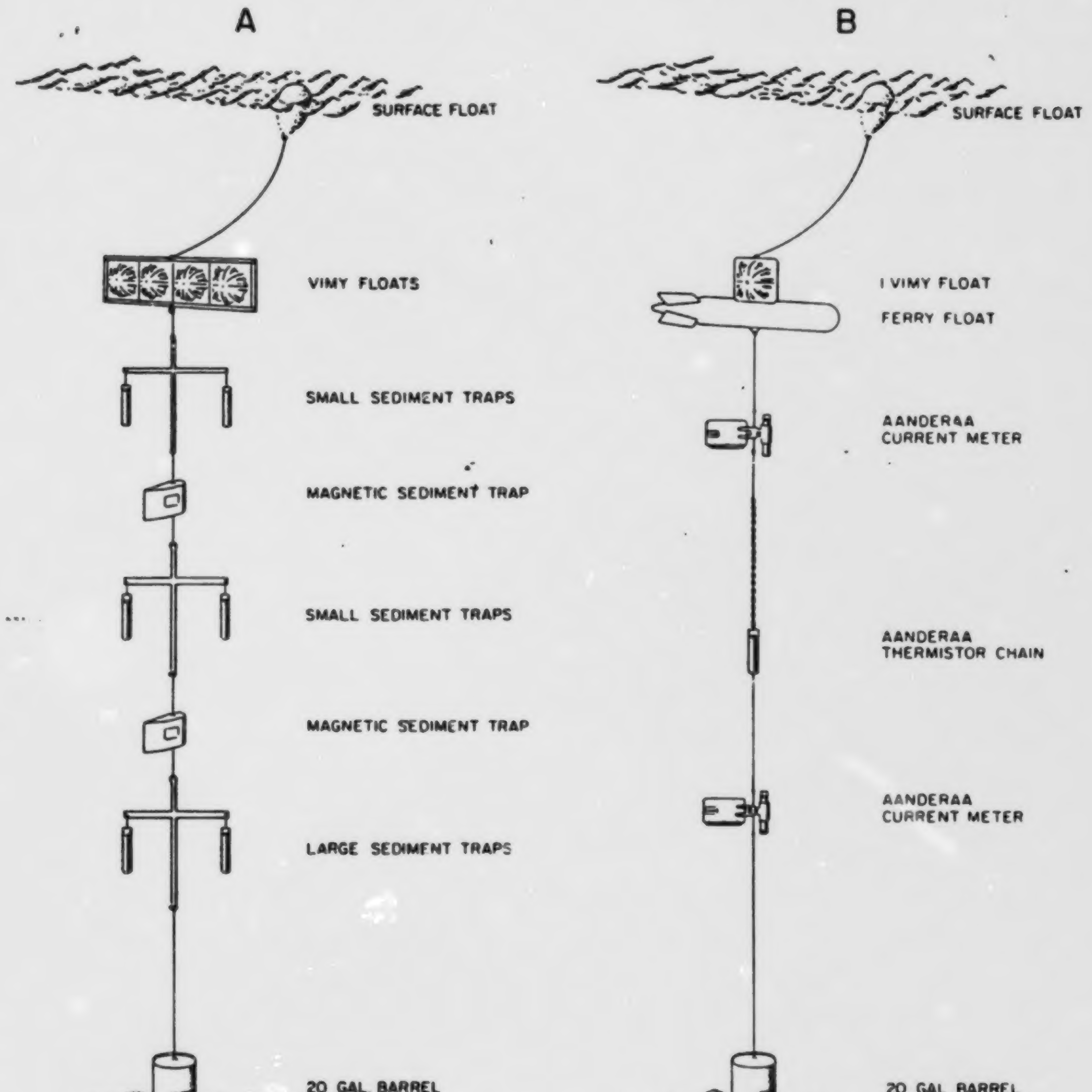
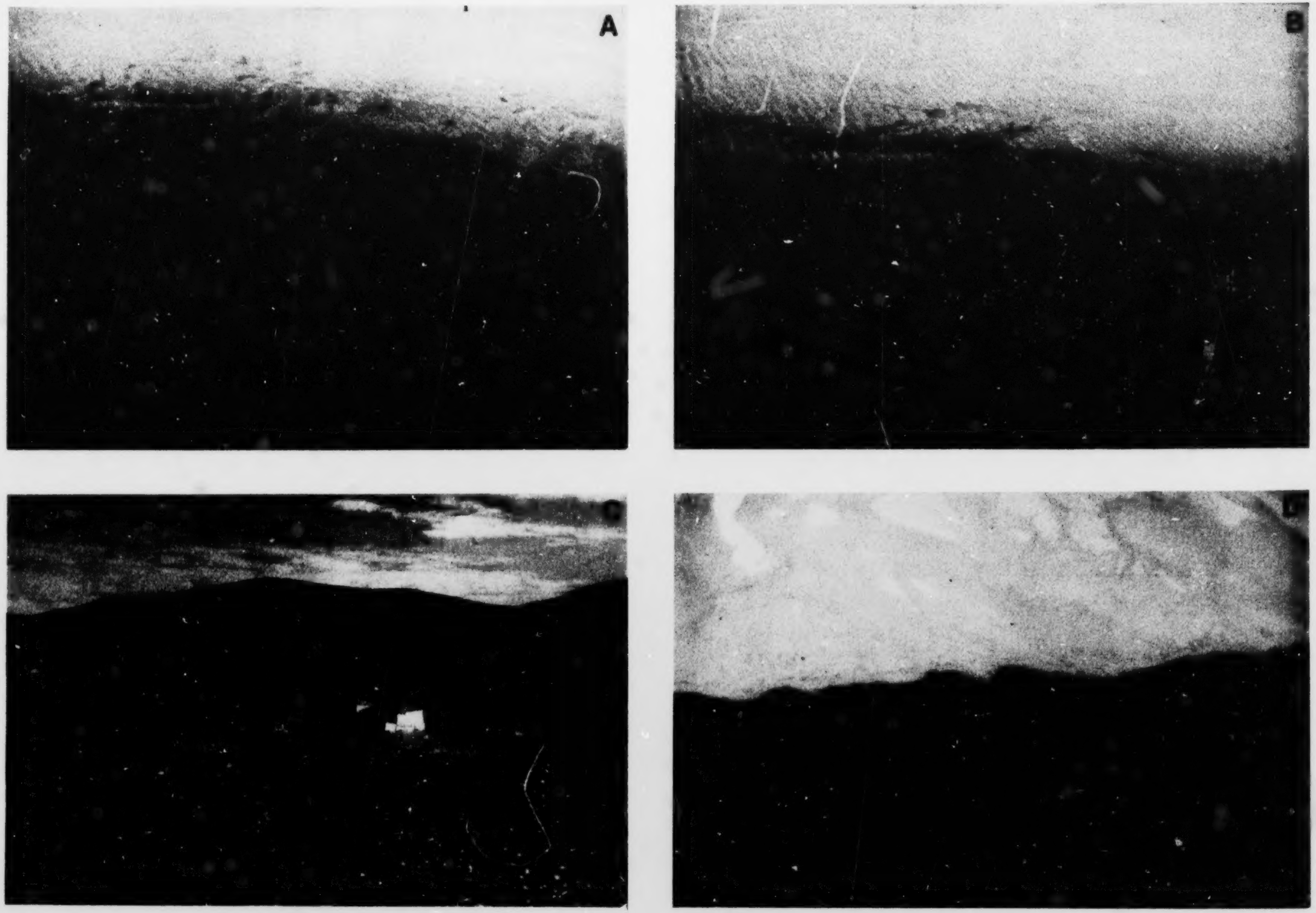


Figure 17.4


A
B
C
D

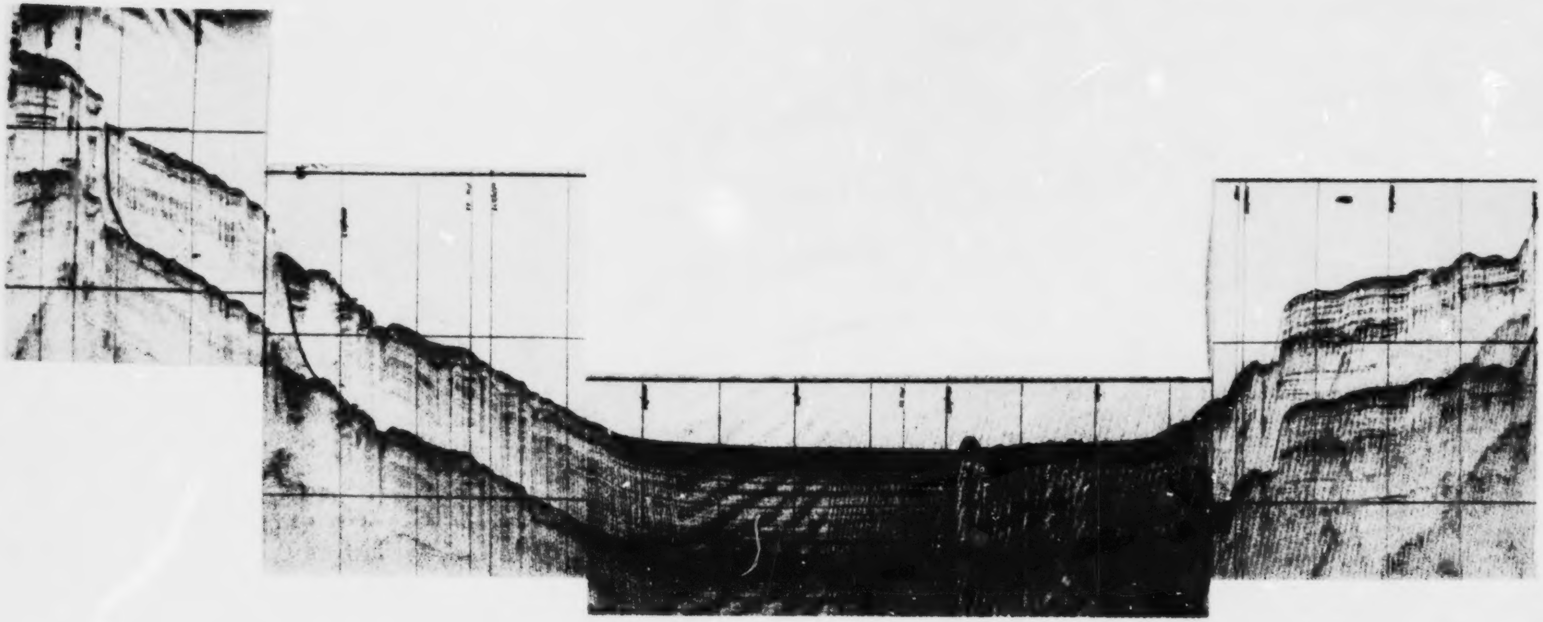
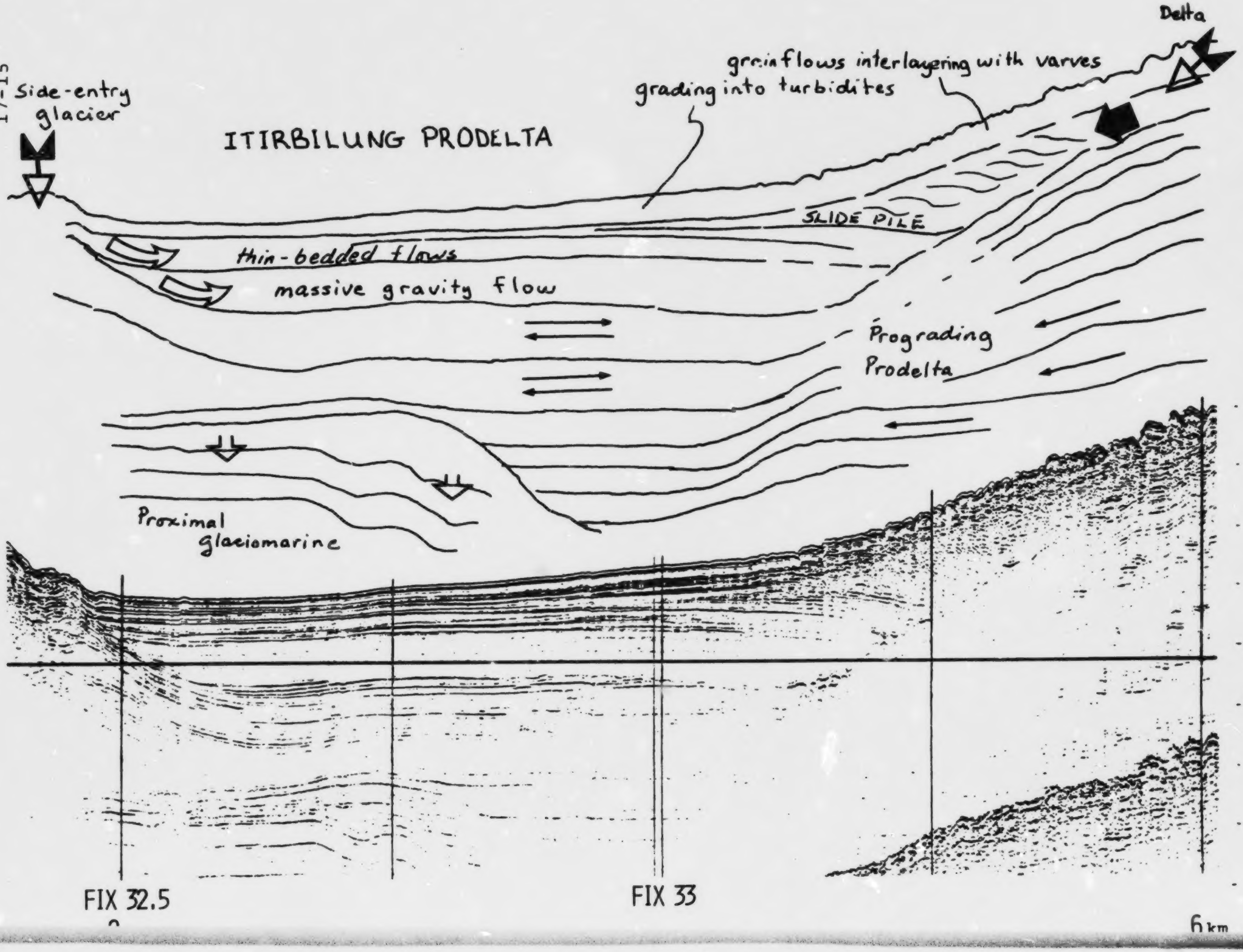


Figure 17.6


ITIRBILUNG PRODELTA
Side-entry glacier
Delta
grainflows interlayering with varves grading into turbidites
SLIDE PILE
thin-bedded flows
massive gravity flow
Prograding Prodelta
Proximal glaciomarine
0.00
0.05
RELATIVE TIME (S)
FIX 32.5
FIX 33
6 km

ITIRBILUNG

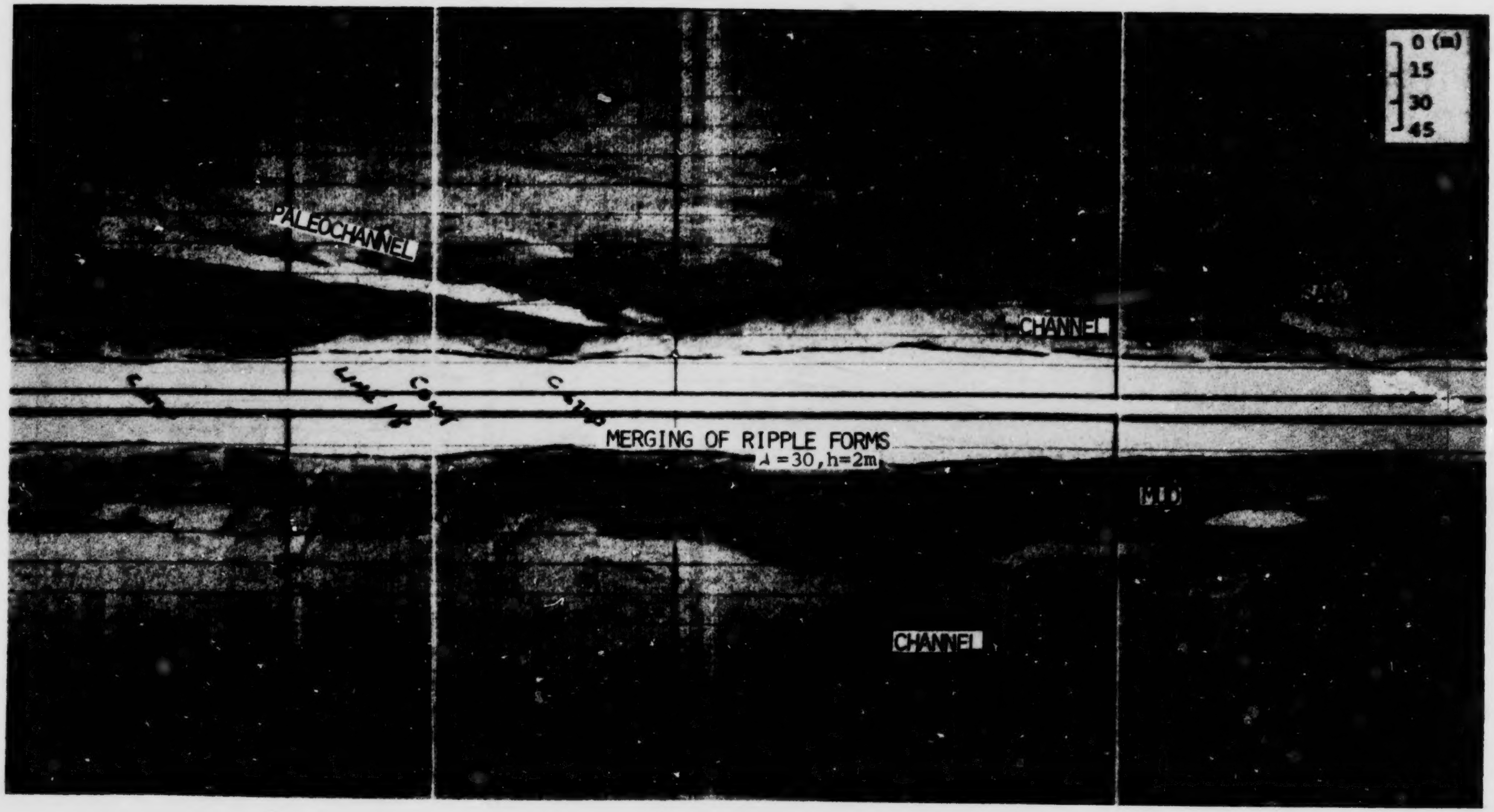


Figure 17.8

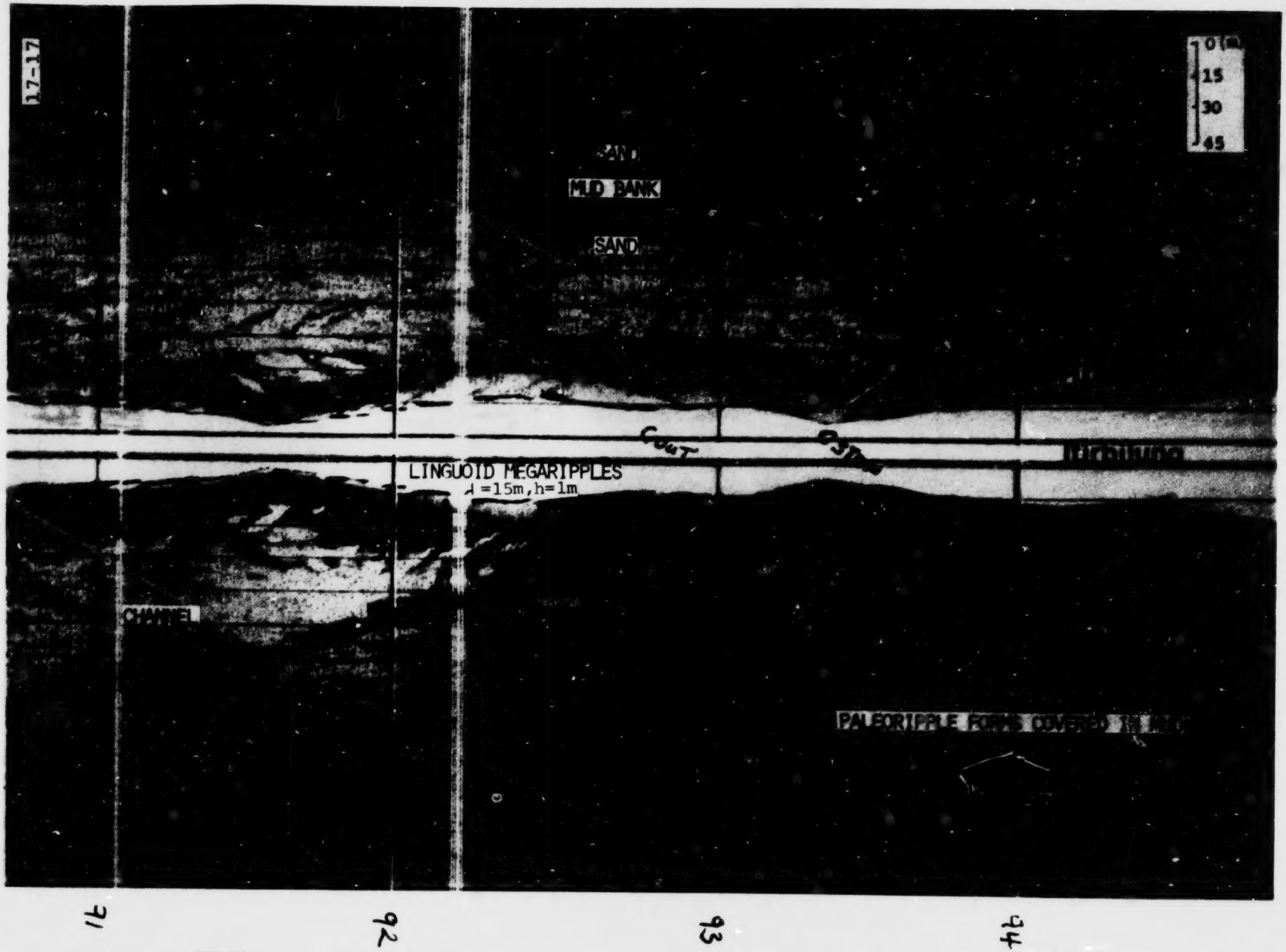
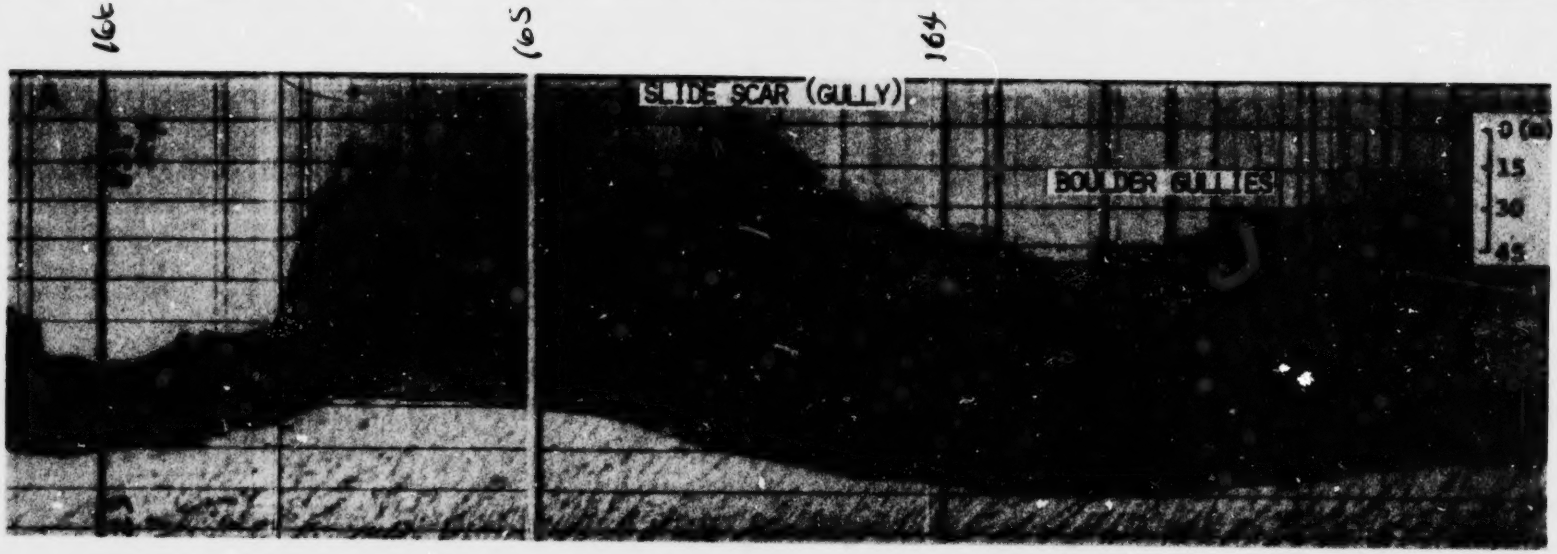

17-17
0 (m)
15
30
45
SAND
MUD BANK
SAND
LINGUOID MEGARIPPLES
λ =15m, h=1m
CHANNEL
PALEORIPPLE FORMS COVERED IN MUD
91
92
93
94
← DELTA
BASIN →

Figure 17.9



Itirbilung Prodelta side-walls

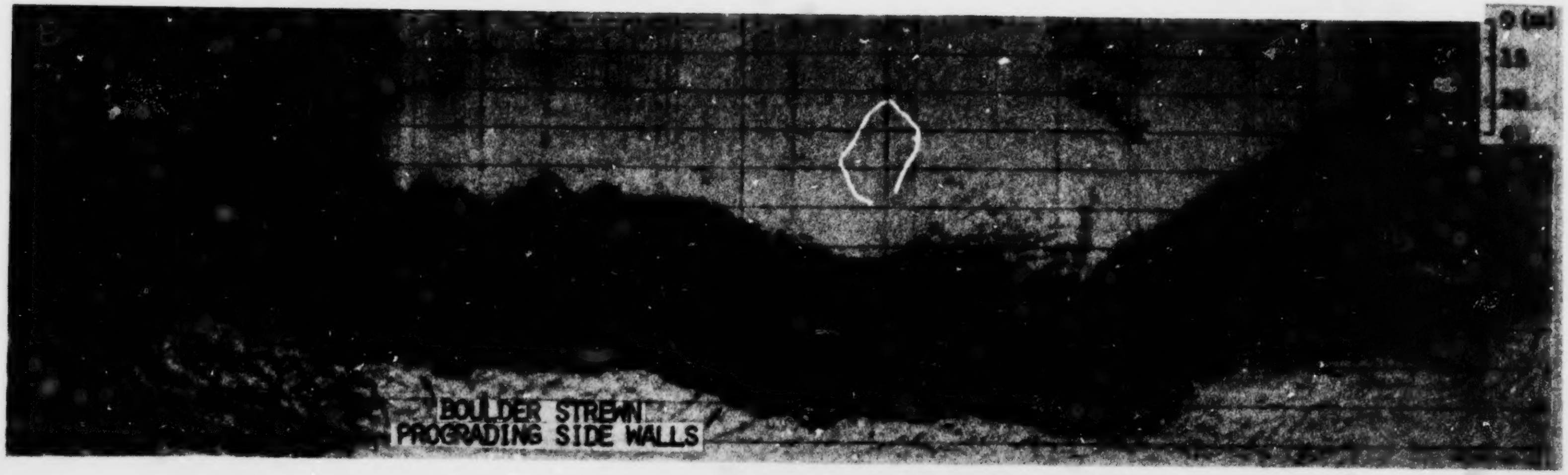
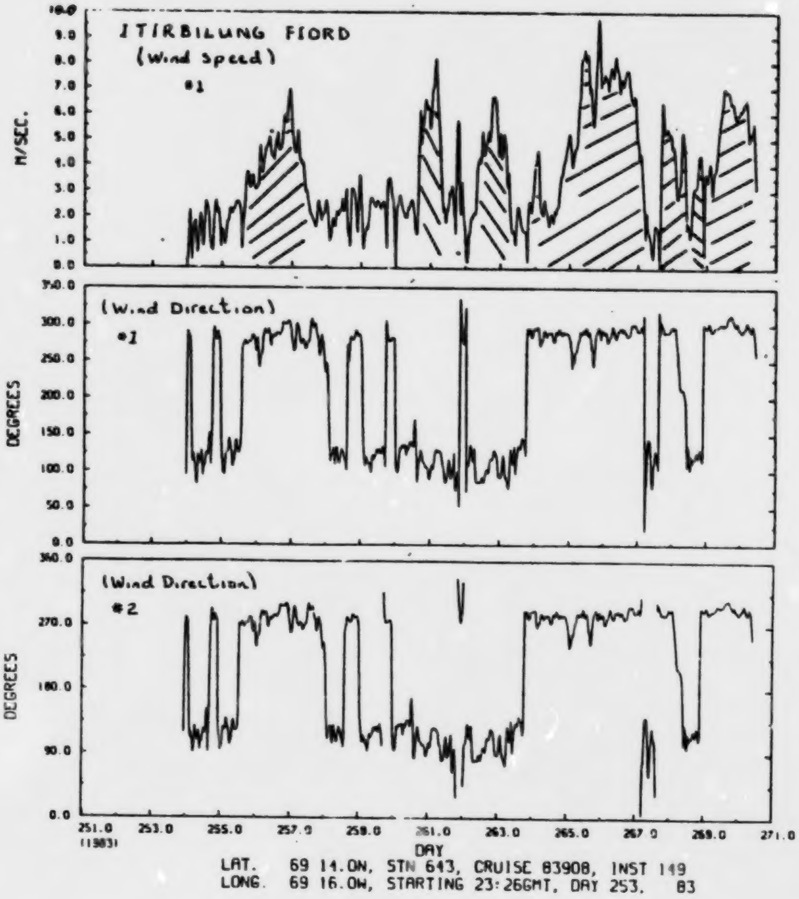


Figure 17.10



270° = up-inlet (///)

90° = down-inlet (\\\)

Figure 17.11

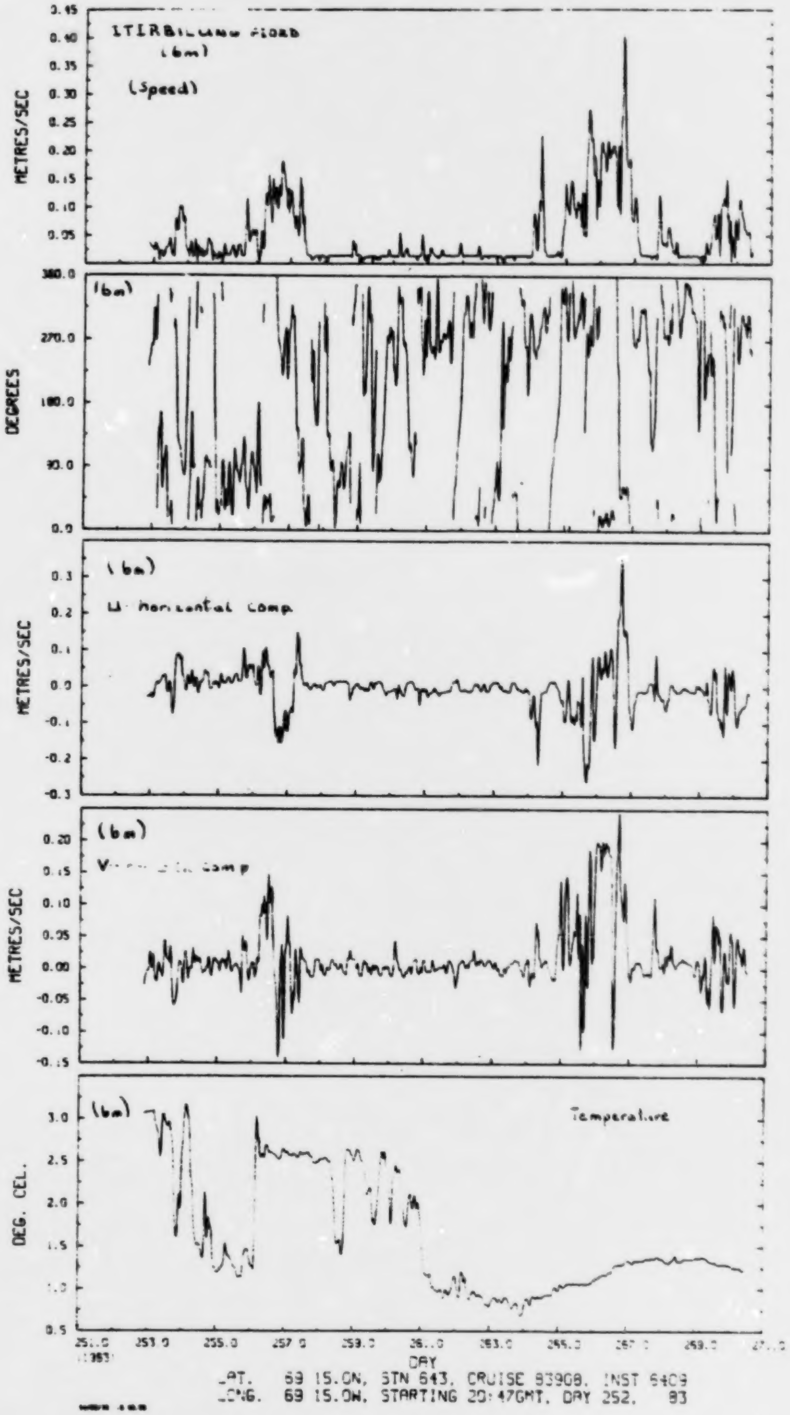

ITIRBILUNG FIORD
(6m)
(Speed)
METRES/SEC
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
(6m)
DEGREES
360.0
270.0
180.0
90.0
0.0
(6m)
U- Horizontal Comp
METRES/SEC
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
(6m)
V- Comp
METRES/SEC
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
(6m)
Temperature
DEG. CEL.
3.0
2.5
2.0
1.5
1.0
0.5
251.0
(1983)
253.0
255.0
257.0
259.0
261.0
263.0
265.0
267.0
269.0
271.0
DAY
LAT. 69 15.0N, STN 643, CRUISE 83908, INST 6409
LONG. 69 15.0W, STARTING 20:47GMT, DAY 252, 83

Figure 17.12

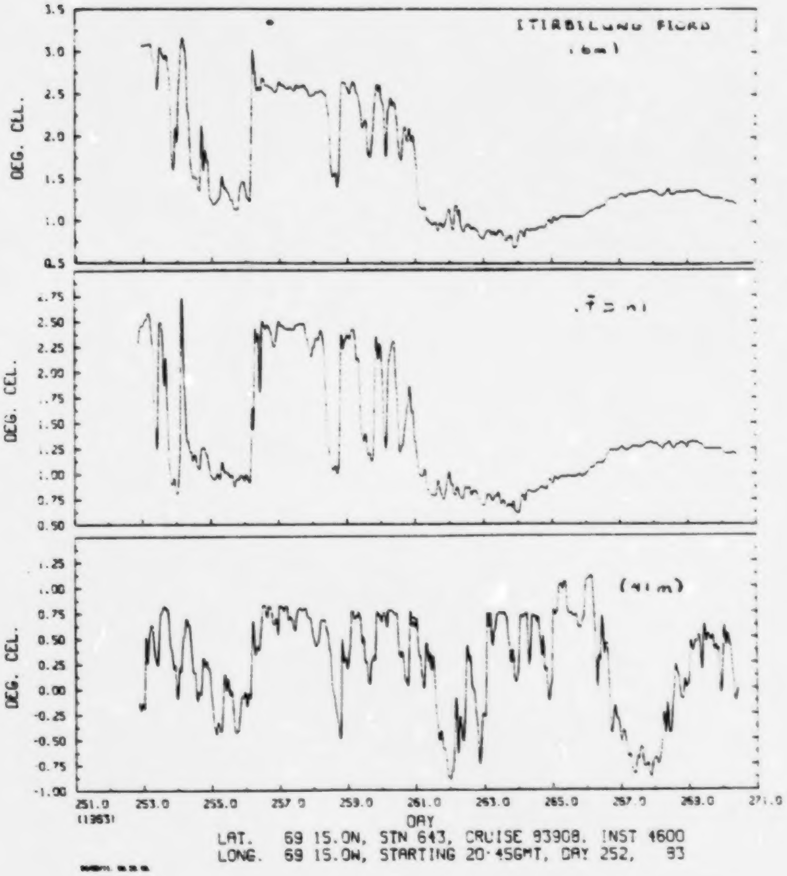
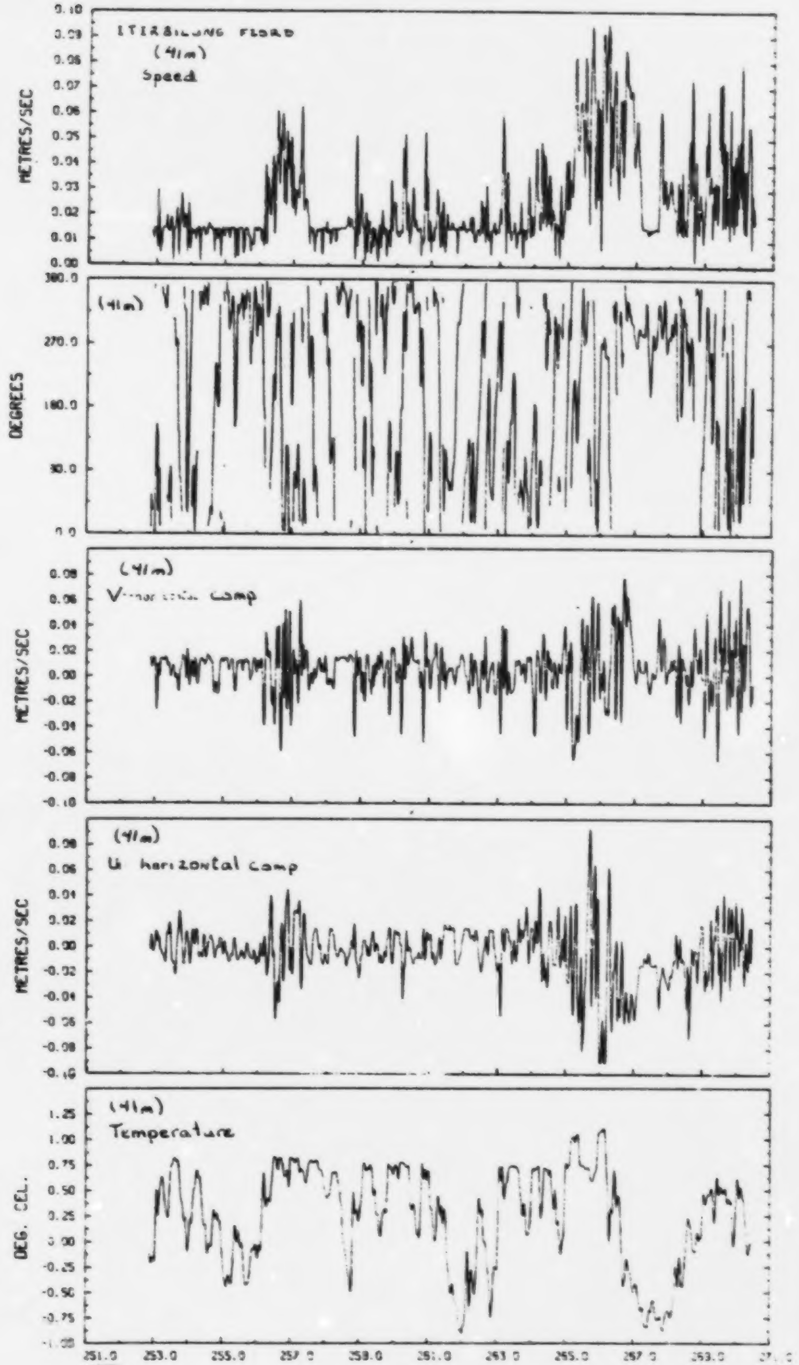
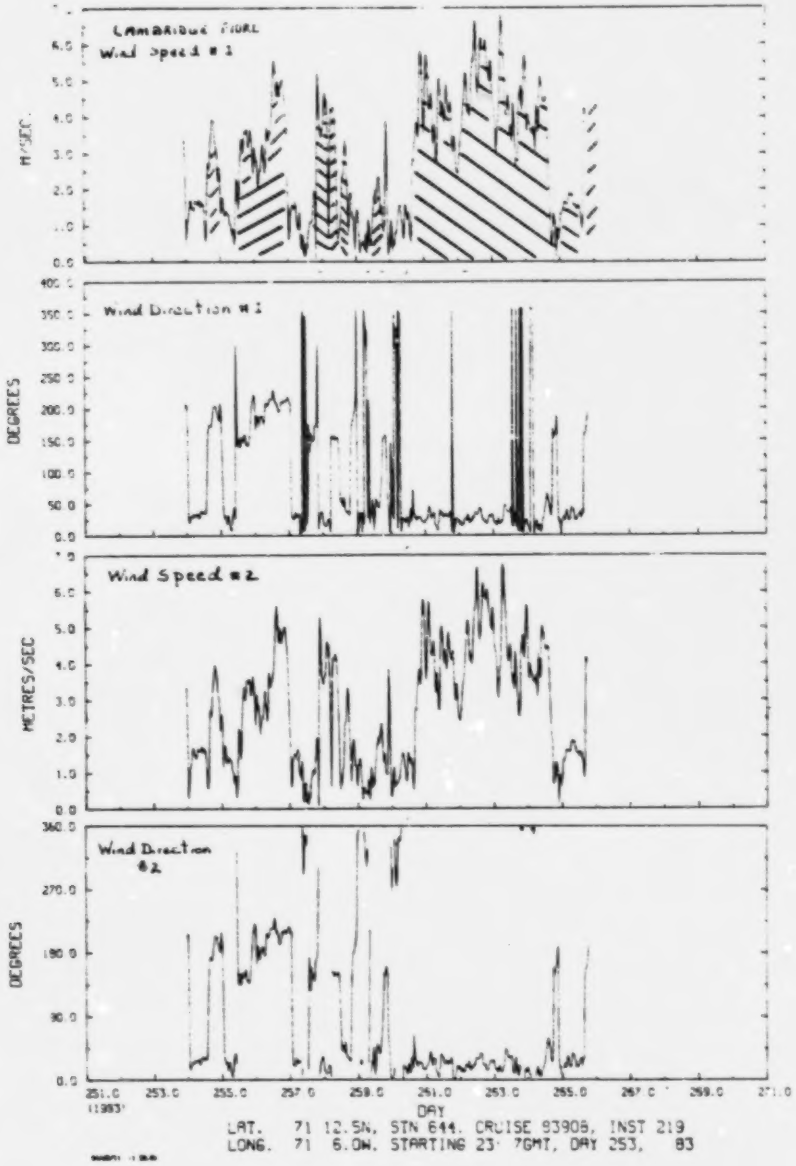

ITIRBILUNG FIORD
(6m)
(41m)
DEG. CEL.
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
1.25
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
251.0
(1983)
253.0
255.0
257.0
259.0
261.0
263.0
265.0
267.0
269.0
271.0
DAY
LAT. 69 15.0N, STN 643, CRUISE 83908. INST 4600
LONG. 69 15.0W, STARTING 20:45GMT, DAY 252, 83

Figure 17.13



LAT. 69 15.0N, STN 643, CRUISE 83908. INST 460C
LONG. 69 15.0W, STARTING 20:45GMT, DAY 252. 83

Figure 17.14



200° = up-inlet ▨

20° = down-inlet ▧

Figure 17.15

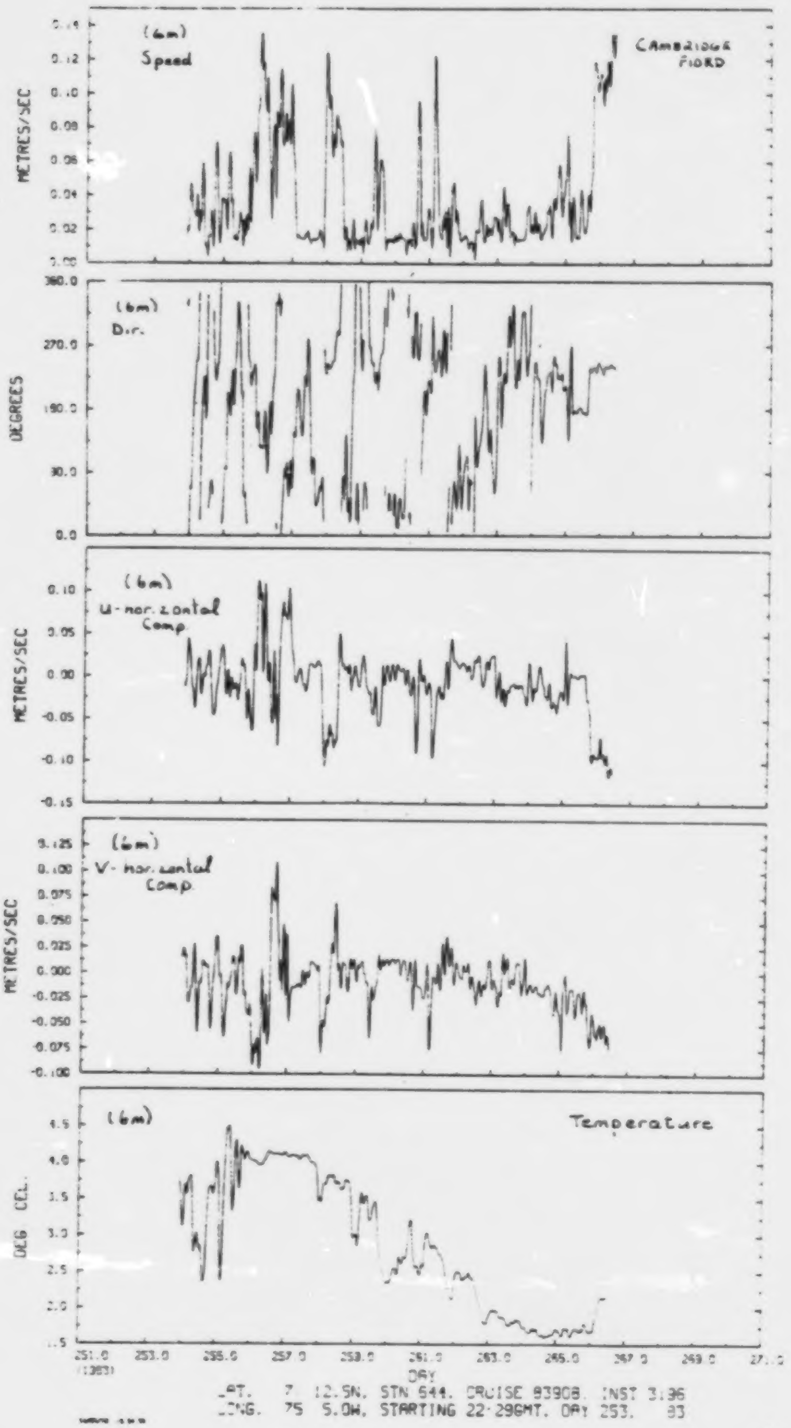

(6m)
Speed
CAMBRIDGE FIORD
METRES/SEC
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
(6m)
Dir.
DEGREES
360.0
270.0
180.0
90.0
0.0
(6m)
U-horizontal Comp.
METRES/SEC
0.10
0.05
0.00
-0.05
-0.10
-0.15
(6m)
V-horizontal Comp.
METRES/SEC
0.125
0.100
0.075
0.050
0.025
0.000
-0.025
-0.050
-0.075
-0.100
(6m)
Temperature
DEG CEL.
4.5
4.0
3.5
3.0
2.5
2.0
1.5
251.0 (1983)
253.0
255.0
257.0
259.0
261.0
263.0
265.0
267.0
269.0
271.0
DAY
LAT. 7 12.5N. STN 544. CRUISE 83908. INST 3136
LONG. 75 5.0W. STARTING 22·29GMT. DAY 253. 83

Figure 17.16

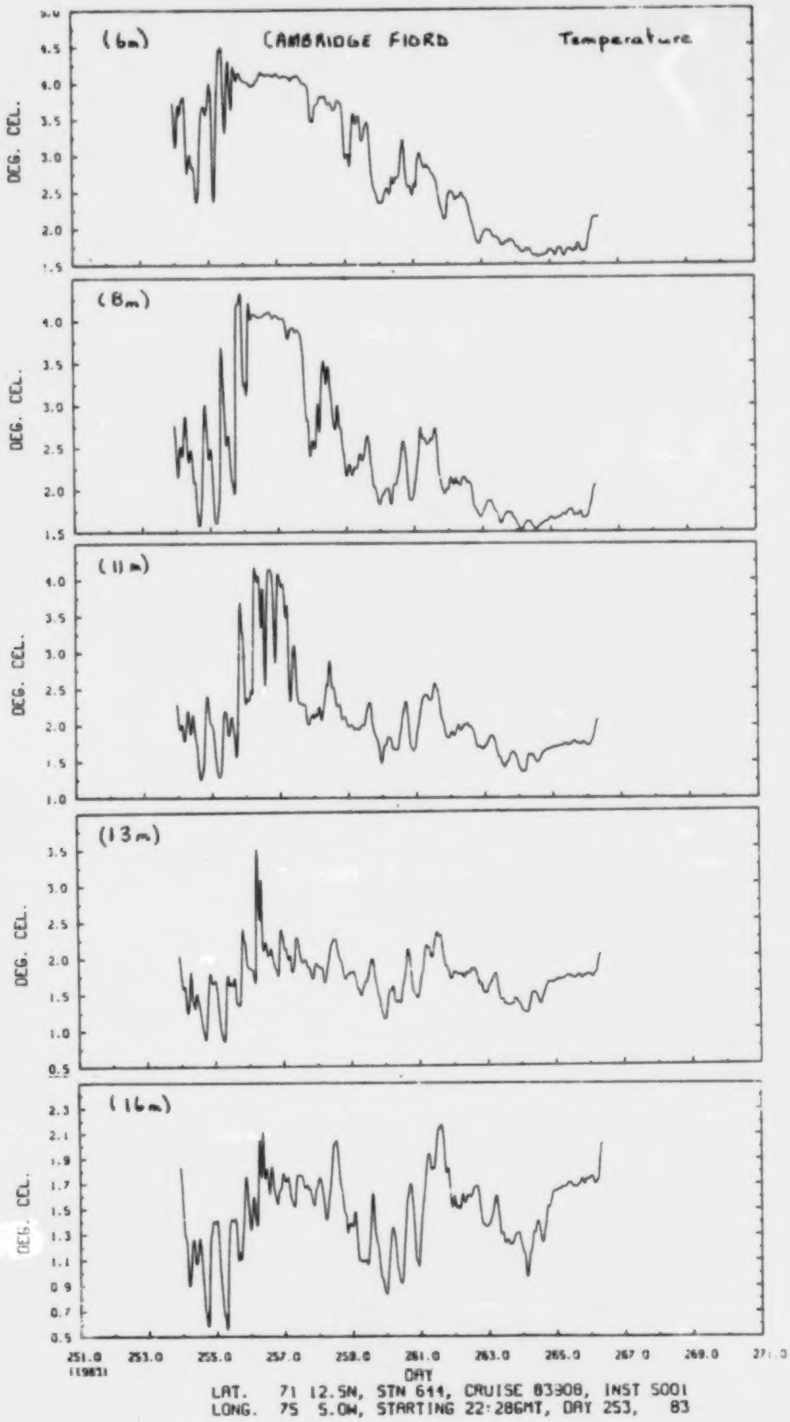
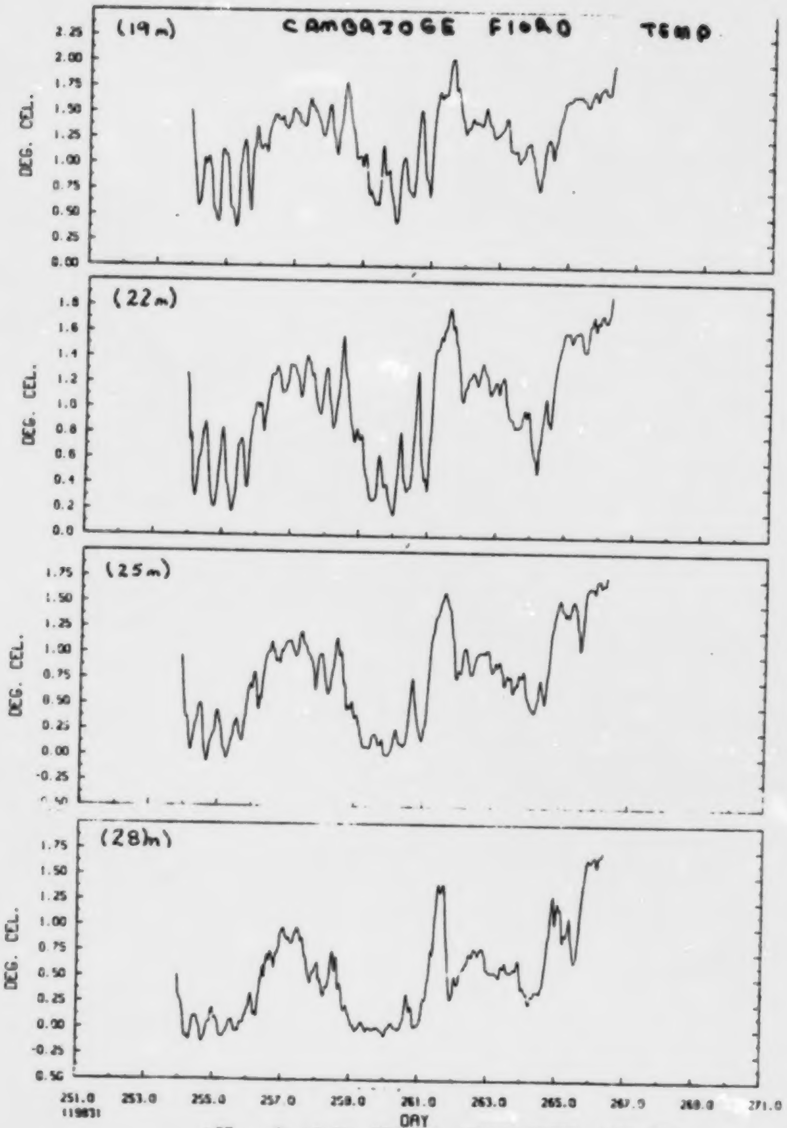

(6m)
CAMBRIDGE FIORD
Temperature
DEG. CEL.
1.5
2.0
2.5
3.0
3.5
4.0
4.5
(8m)
DEG. CEL.
1.5
2.0
2.5
3.0
3.5
4.0
(11m)
DEG. CEL.
1.0
1.5
2.0
2.5
3.0
3.5
4.0
(13m)
DEG. CEL.
0.5
1.0
1.5
2.0
2.5
3.0
3.5
(16m)
DEG. CEL.
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
2.1
2.3
251.0
(1983)
253.0
255.0
257.0
259.0
261.0
263.0
265.0
267.0
269.0
DAY
LAT. 71 12.5N, STN 644, CRUISE 83308, INST 5001
LONG. 75 5.0W, STARTING 22:28GMT, DAY 253, 83

Figure 17.17



LAT. 71 12.5N, STN 644, CRUISE 83908, INST 5001
LONG. 75 5.0W, STARTING 22:28GMT, DAY 253, 93

Figure 17.18

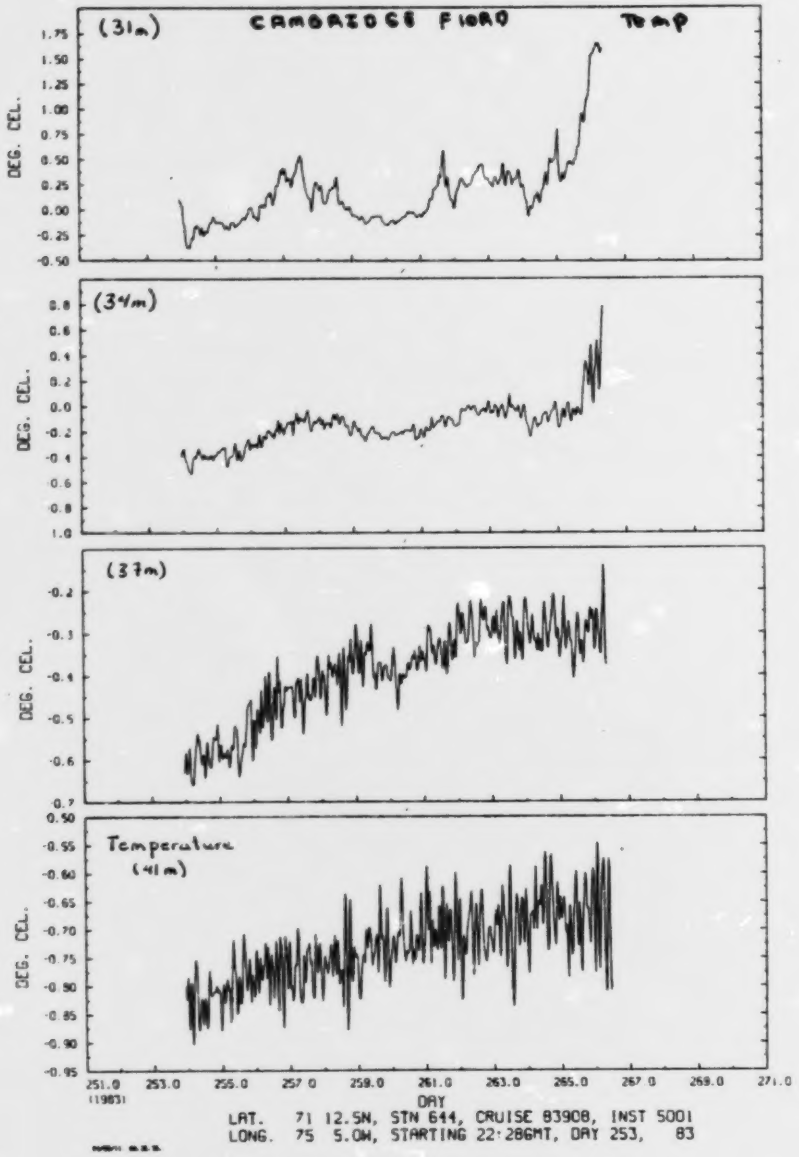
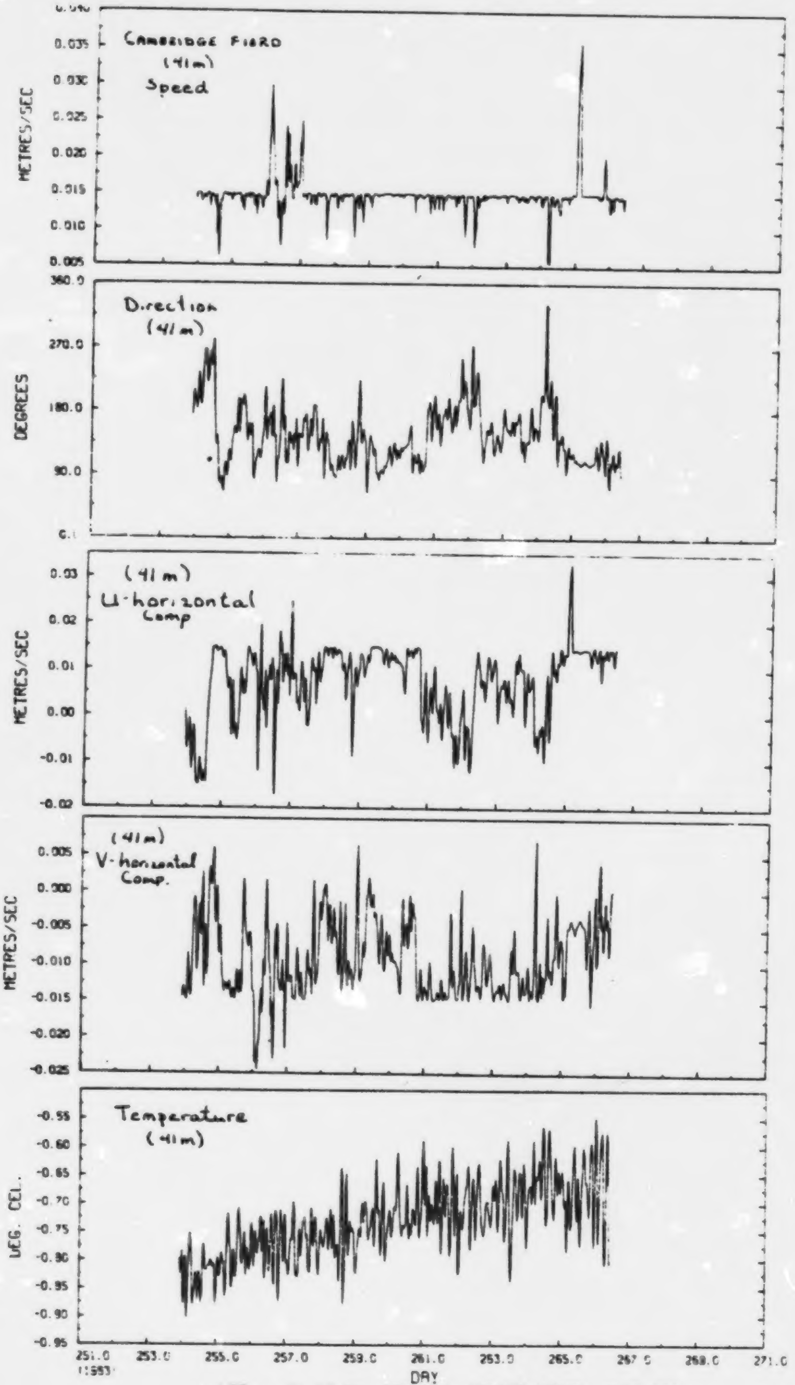

(31m)
CAMBRIDGE FIORD
Temp
DEG. CEL.
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
(34m)
DEG. CEL.
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
1.0
(37m)
DEG. CEL.
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
Temperature
(41m)
DEG. CEL.
0.50
-0.55
-0.60
-0.65
-0.70
-0.75
-0.80
-0.85
-0.90
-0.95
251.0
(1983)
253.0
255.0
257.0
259.0
261.0
263.0
265.0
267.0
269.0
271.0
DAY
LAT. 71 12.5N, STN 644, CRUISE 83908, INST 5001
LONG. 75 5.0W, STARTING 22:28GMT, DAY 253, 83

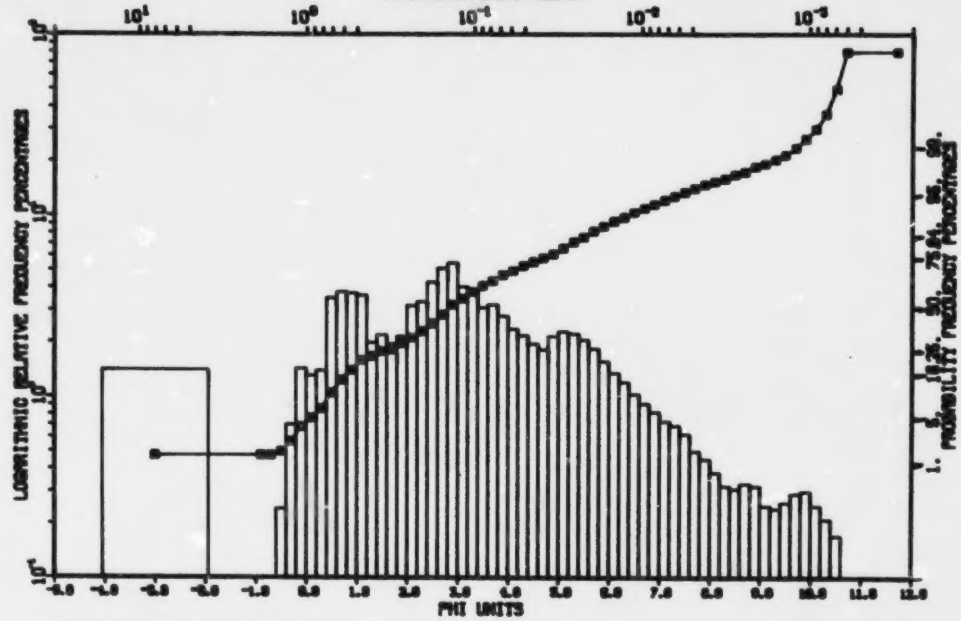
Figure 17.19



LAT. 71 12.5N, STN 644, CRUISE 83908, INST 500.
LONG. 75 5.0W, STARTING 22:28GMT, DAY 253, 83

Figure 17.20

CA-1 BMD GRAB PRODELTA
SAMPLE 2083
MILLIMETER EQUIVALENTS



CA-2 BMD GRAB PRODELTA
SAMPLE 2084
MILLIMETER EQUIVALENTS

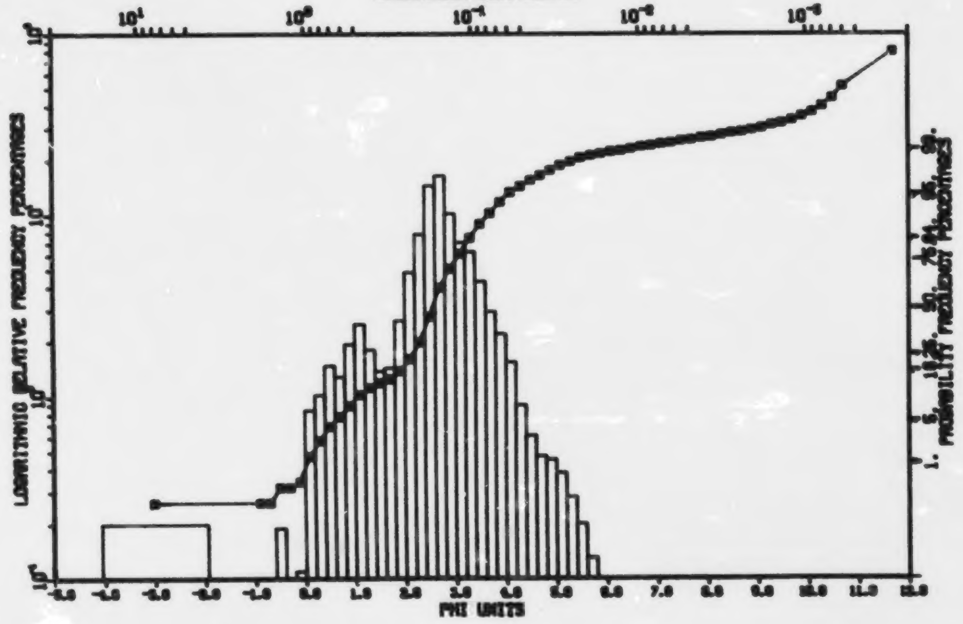
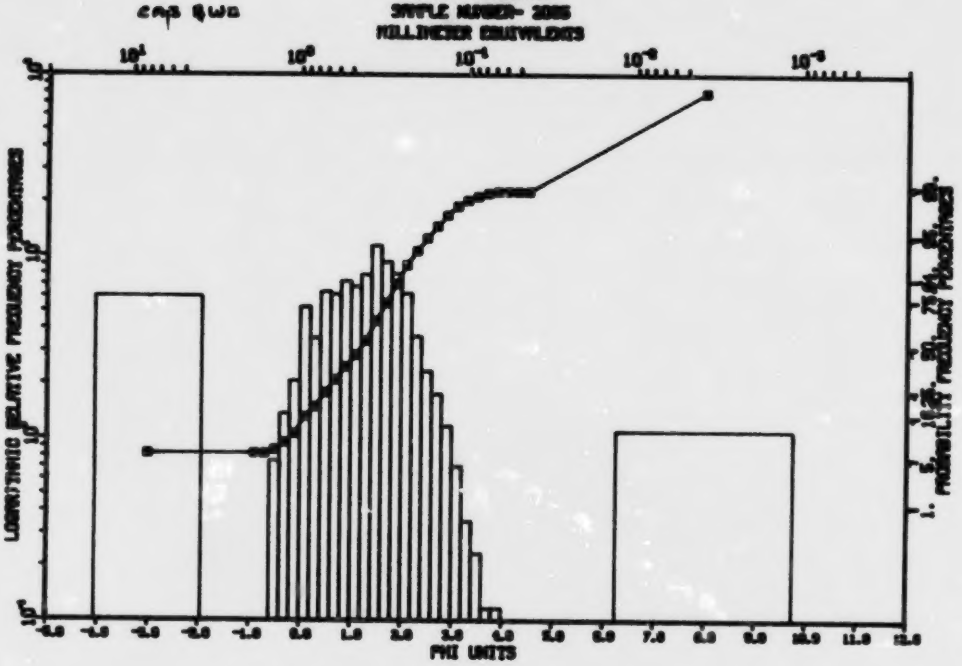
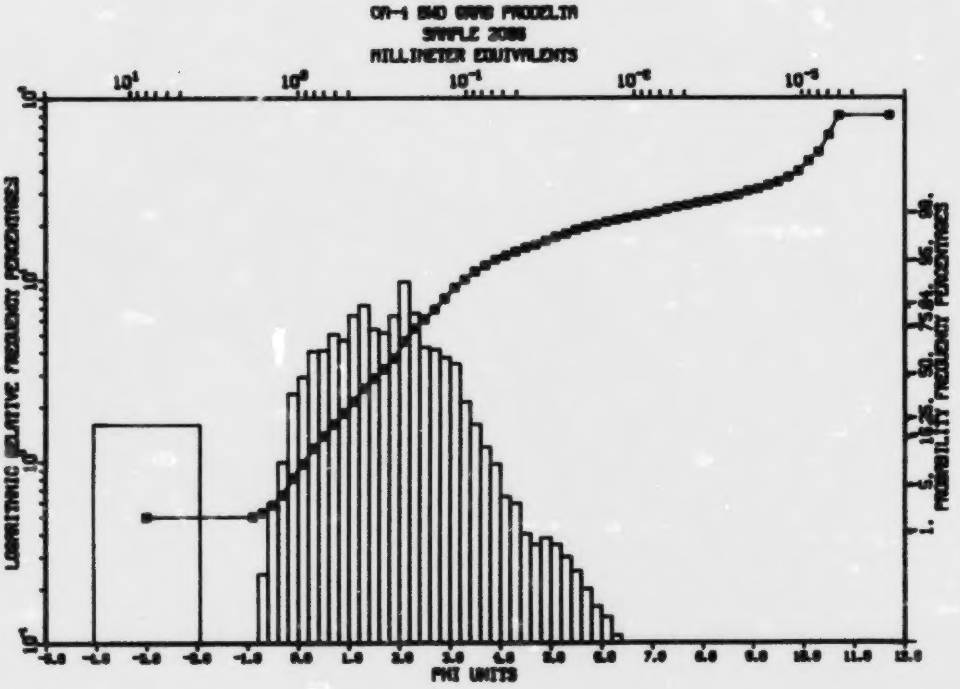
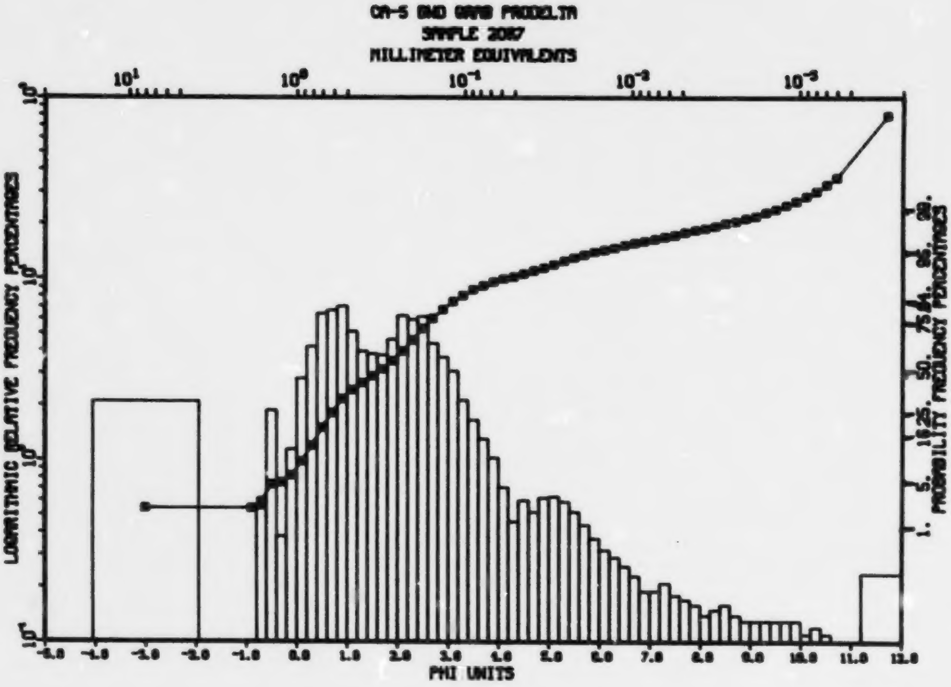
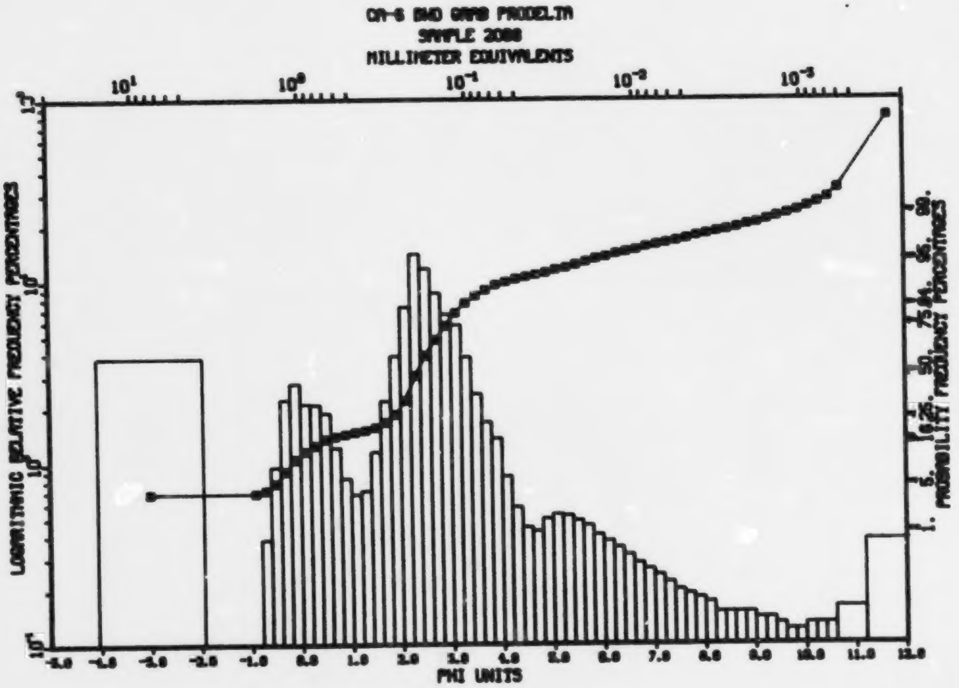


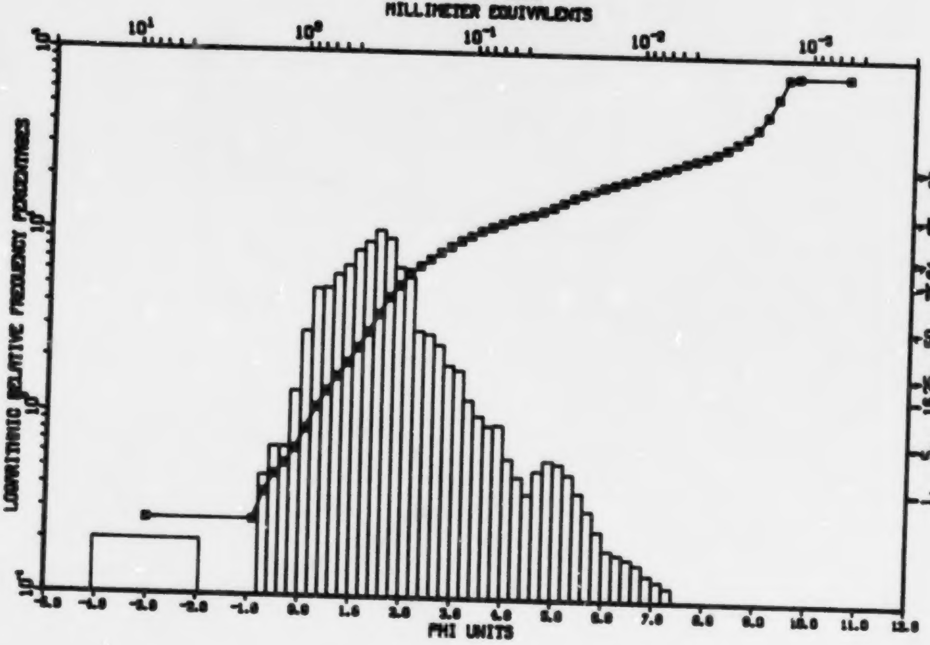
Figure 17.21


CAB BWD
83-028 (8310808)
SAMPLE NUMBER- 2085
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

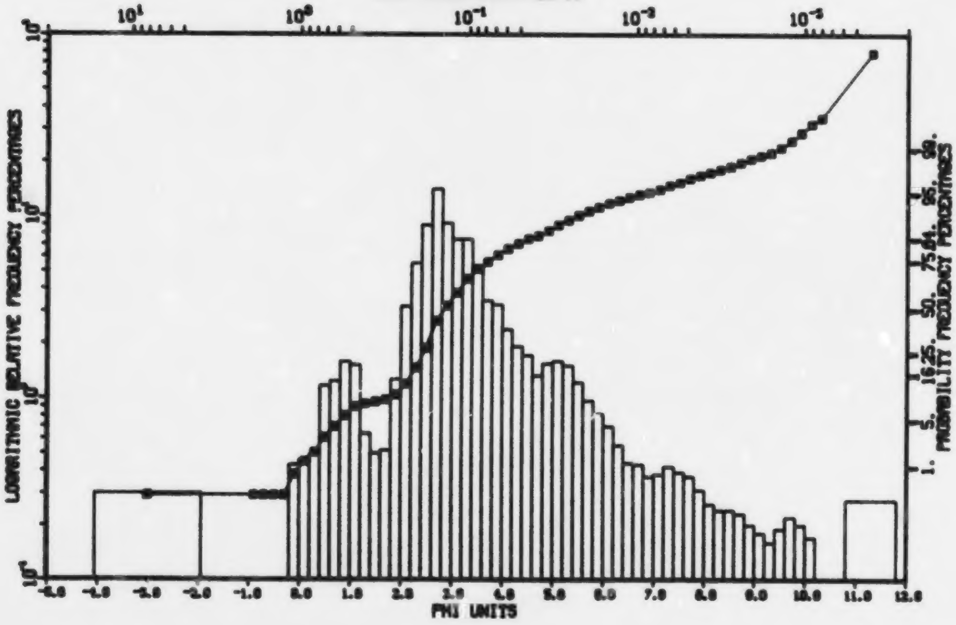

CR-1 BWD GRAB PRODELTA
SAMPLE 2086
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


CA-5 BND GRAB PRODELTA
SAMPLE 2087
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{2}
10^{1}
10^{0}
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

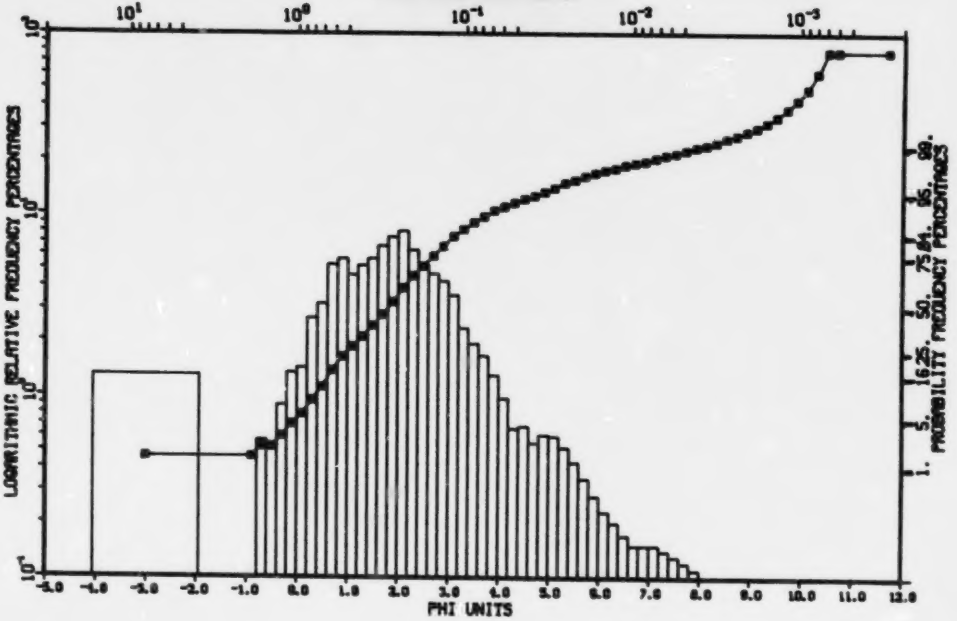

CA-6 BND GRAB PRODELTA
SAMPLE 2088
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{2}
10^{1}
10^{0}
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS



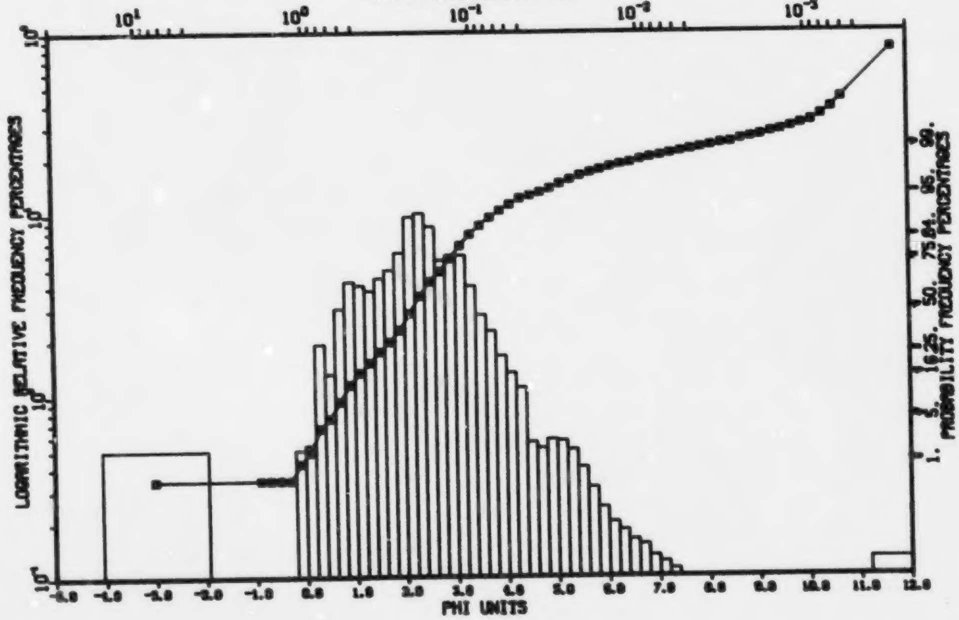
CA-7 BND GRAB PRODELTA
SAMPLE 2088



CA-8 BND GRAB PRODELTA
SAMPLE 2070

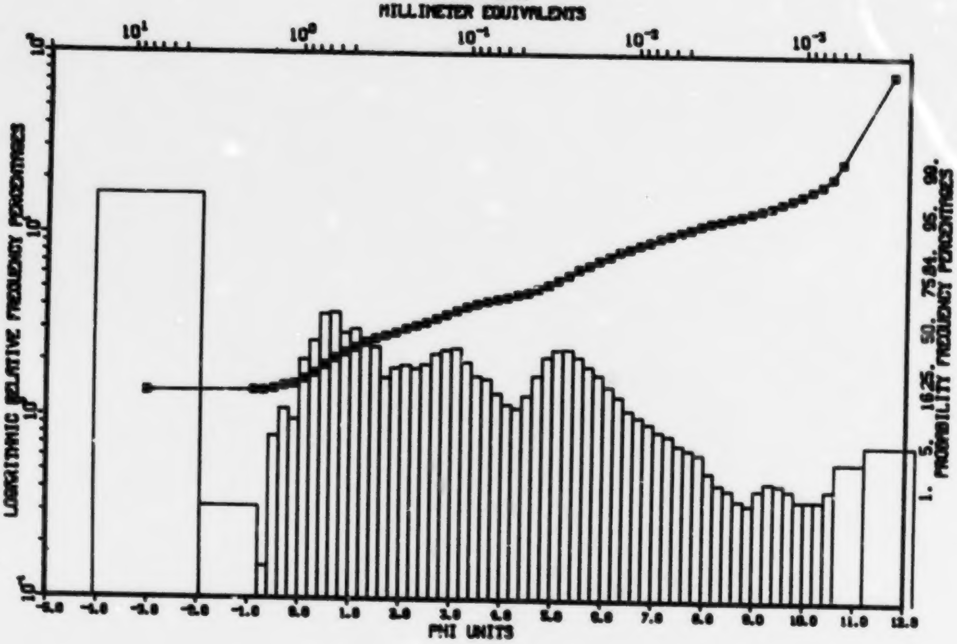


CA10 BND GRAB PRODELTA
SAMPLE 2071

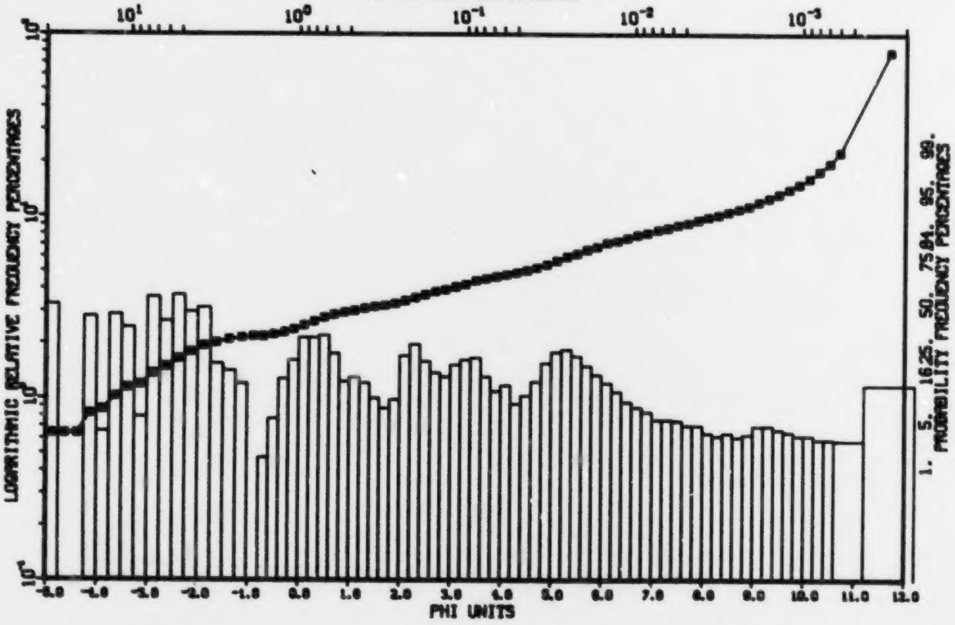


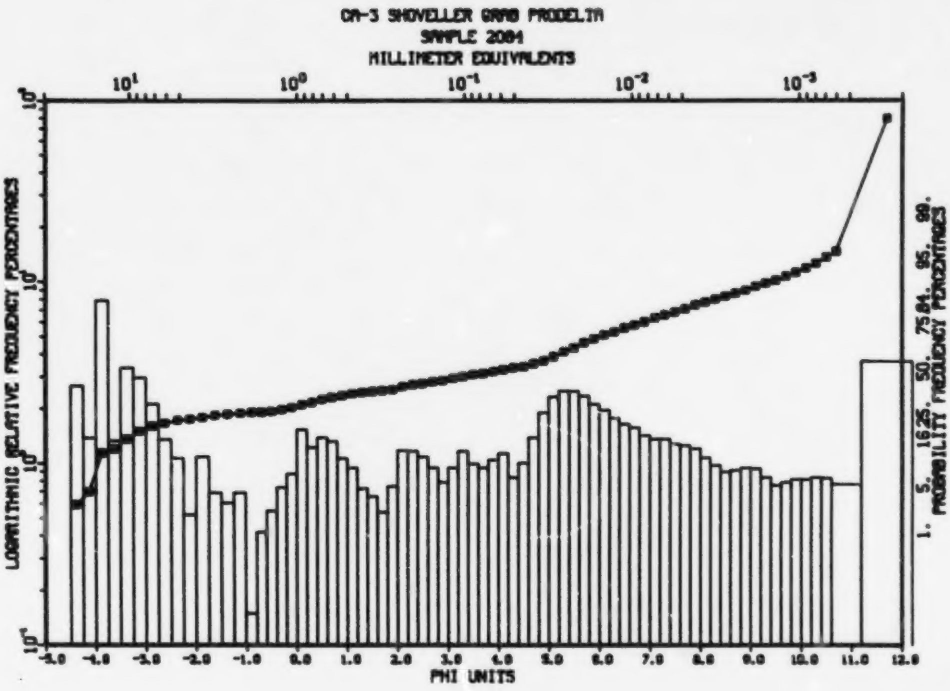
CA11 BND GRAB PRODELTA
SAMPLE 2072

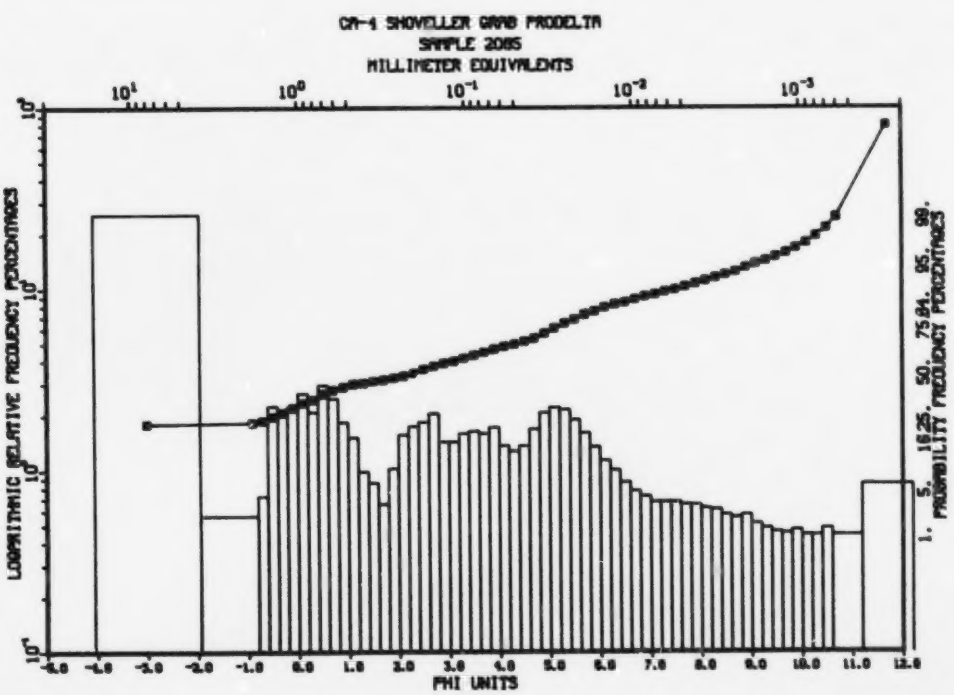
CA-1 SHOVELLER GRAB PRODELTA
SAMPLE 2082
MILLIMETER EQUIVALENTS



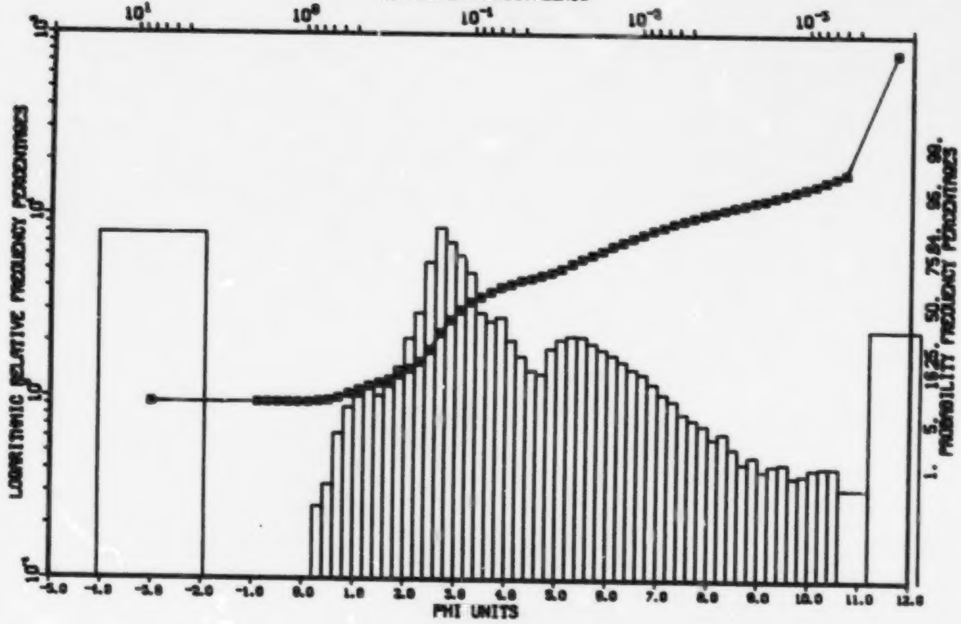
CA-2 SHOVELLER GRAB PRODELTA
SAMPLE 2083
MILLIMETER EQUIVALENTS



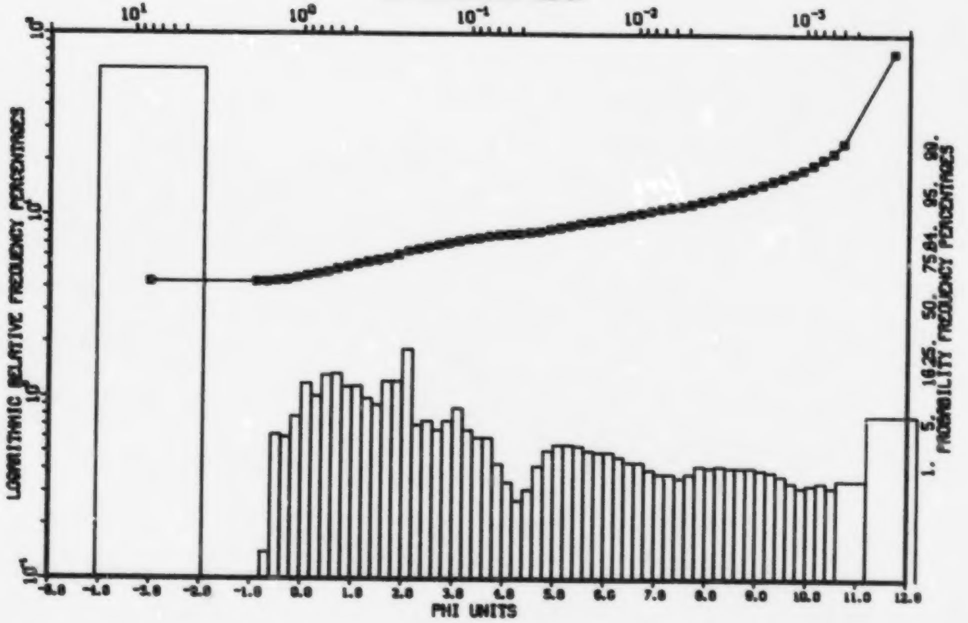

CA-3 SHOVELLER GRAB PRODELTA
SAMPLE 2084
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^2
10^1
10^0
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1. 5. 16.25. 50. 75.84. 95. 99.
PROBABILITY FREQUENCY PERCENTAGES
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

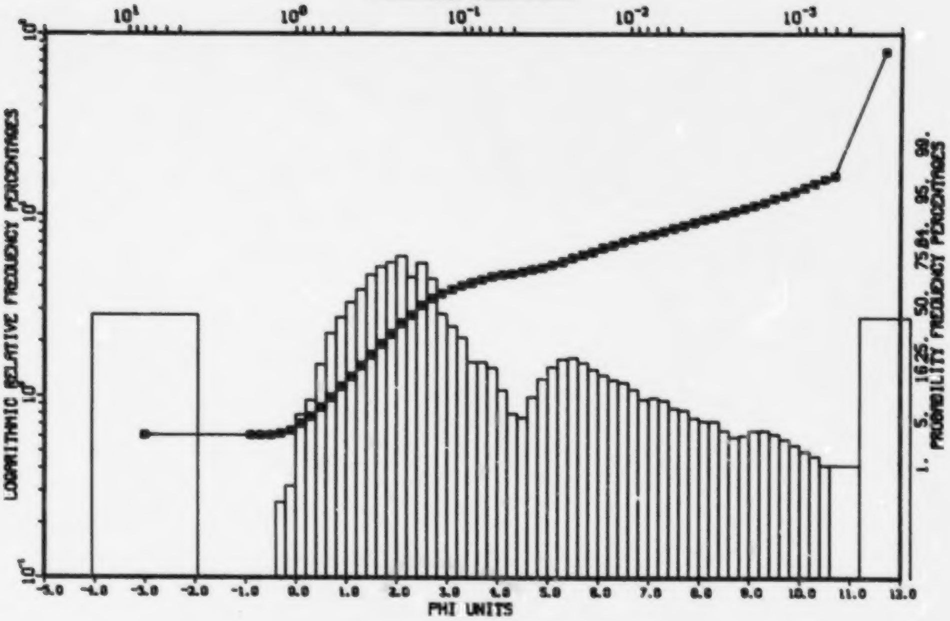

CA-4 SHOVELLER GRAB PRODELTA
SAMPLE 2085
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^2
10^1
10^0
10^{-1}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1. 5. 16.25. 50. 75.84. 95. 99.
PROBABILITY FREQUENCY PERCENTAGES
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

CA-5 SHOVELLER GRAB PRODELTA
SAMPLE 2086
MILLIMETER EQUIVALENTS

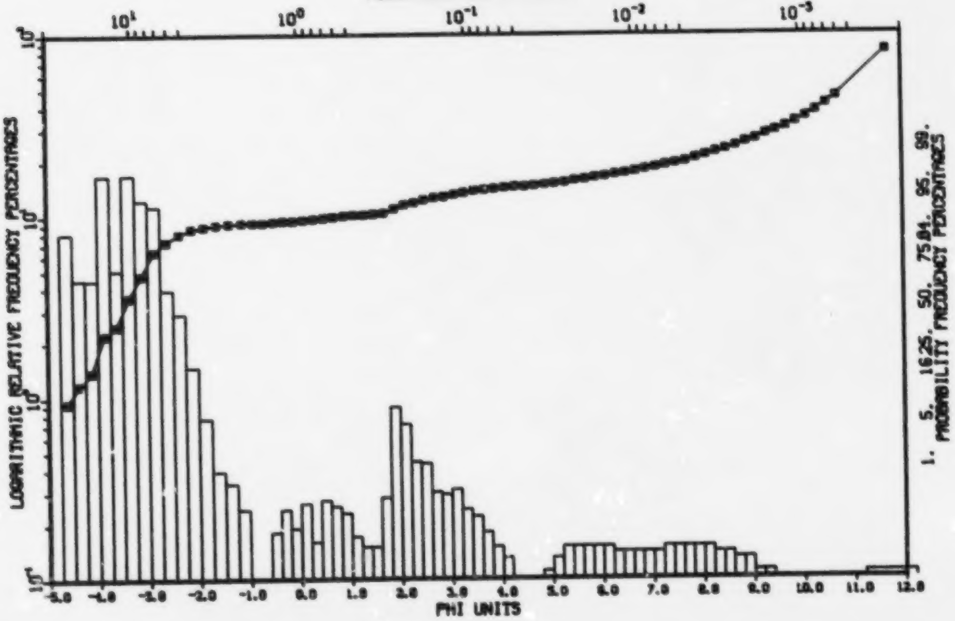


CA-6 SHOVELLER GRAB PRODELTA
SAMPLE 2087
MILLIMETER EQUIVALENTS





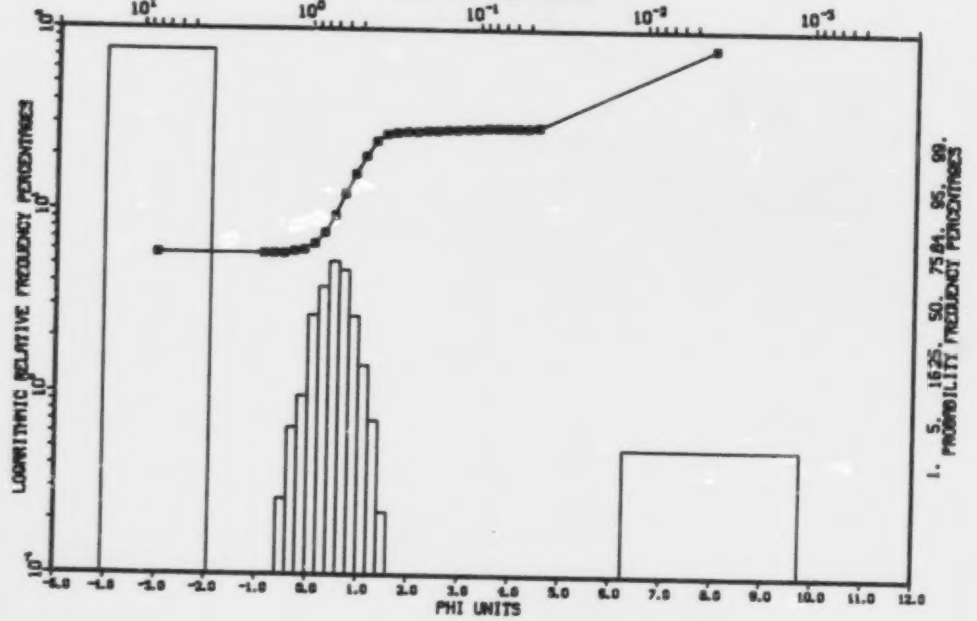
GA-7 SHOVELLER GRAB PRODELTA
SAMPLE 2088
MILLIMETER EQUIVALENTS



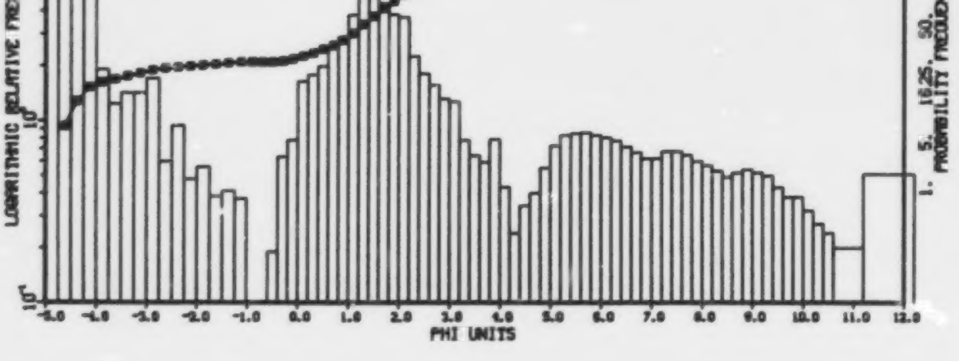
GA-8 SHOVELLER GRAB PRODELTA
SAMPLE 2089
MILLIMETER EQUIVALENTS

CA-10 SHOVELLER

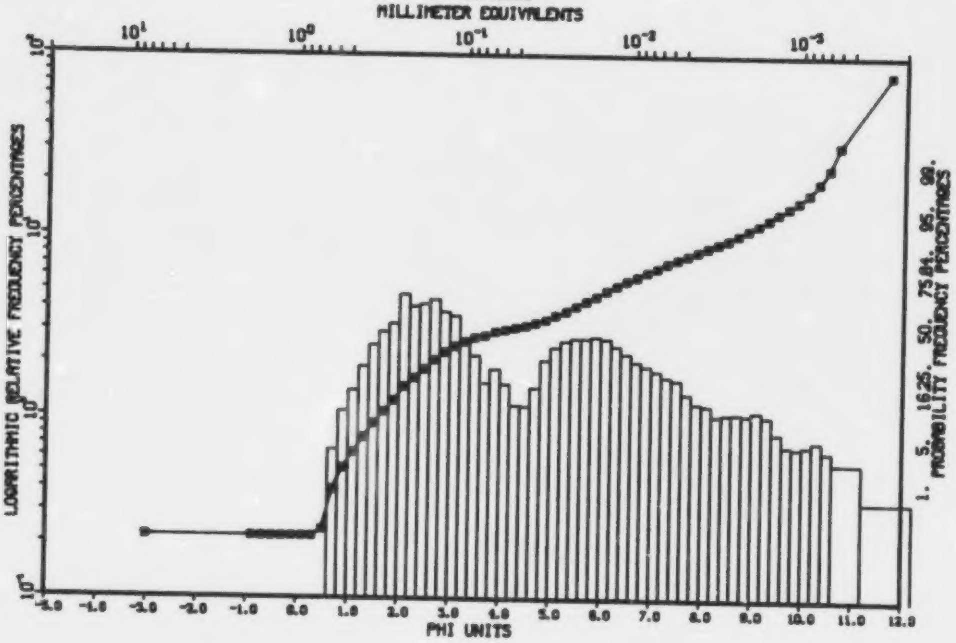
FJORD 83-028 (8312208)
SAMPLE NUMBER- 2090
MILLIMETER EQUIVALENTS



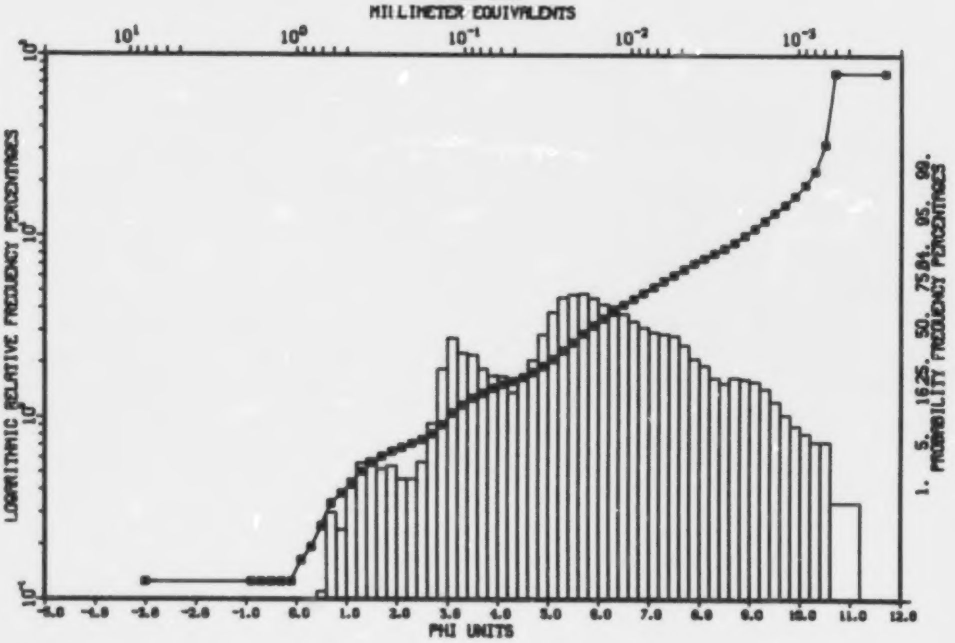
CA-10 SHOVELLER GRAB PRODELTA
SAMPLE 2091
MILLIMETER EQUIVALENTS



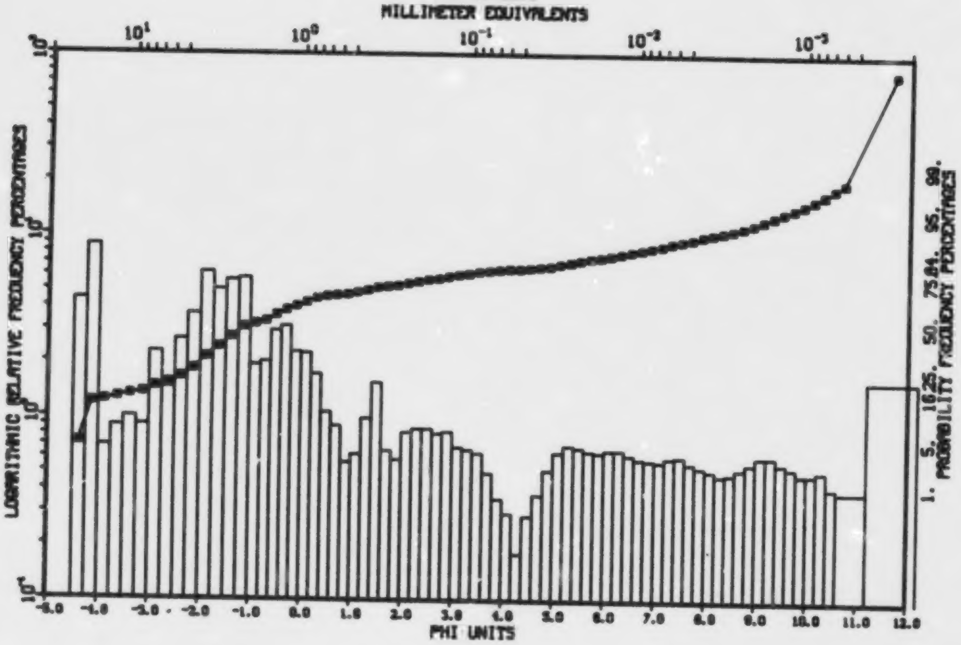
CA-11 SHOVELLER GRAB PRODELTA
SAMPLE 2092



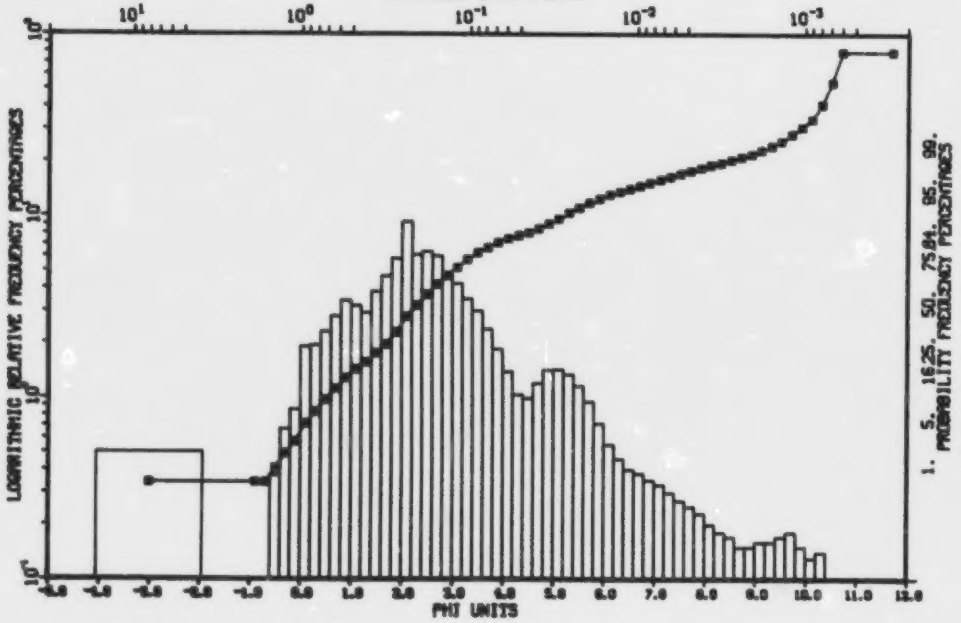
CA-12 SHOVELLER GRAB PRODELTA
SAMPLE 2093

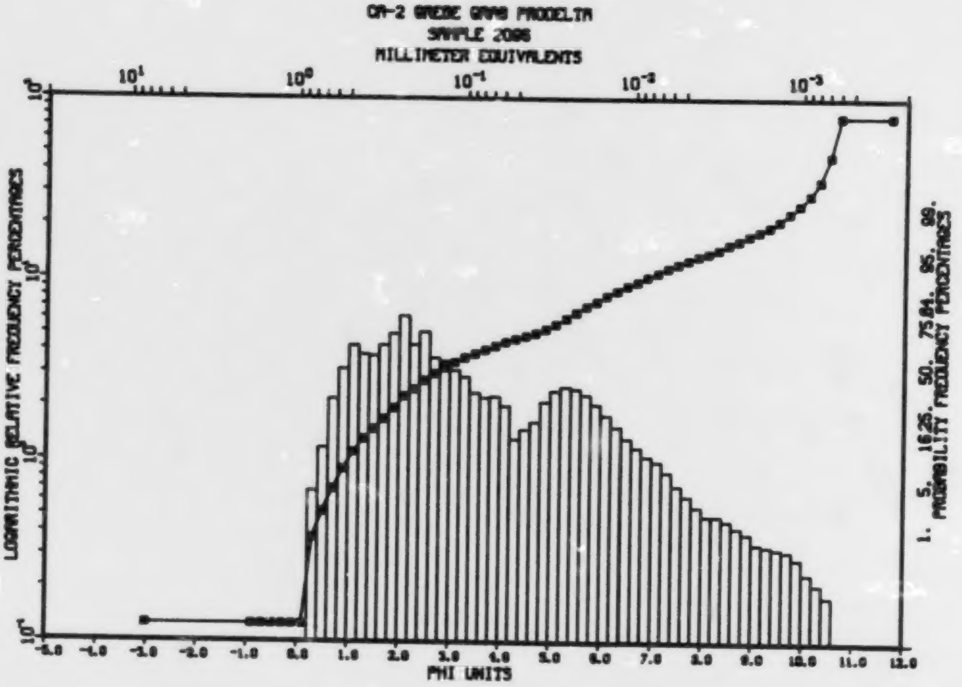


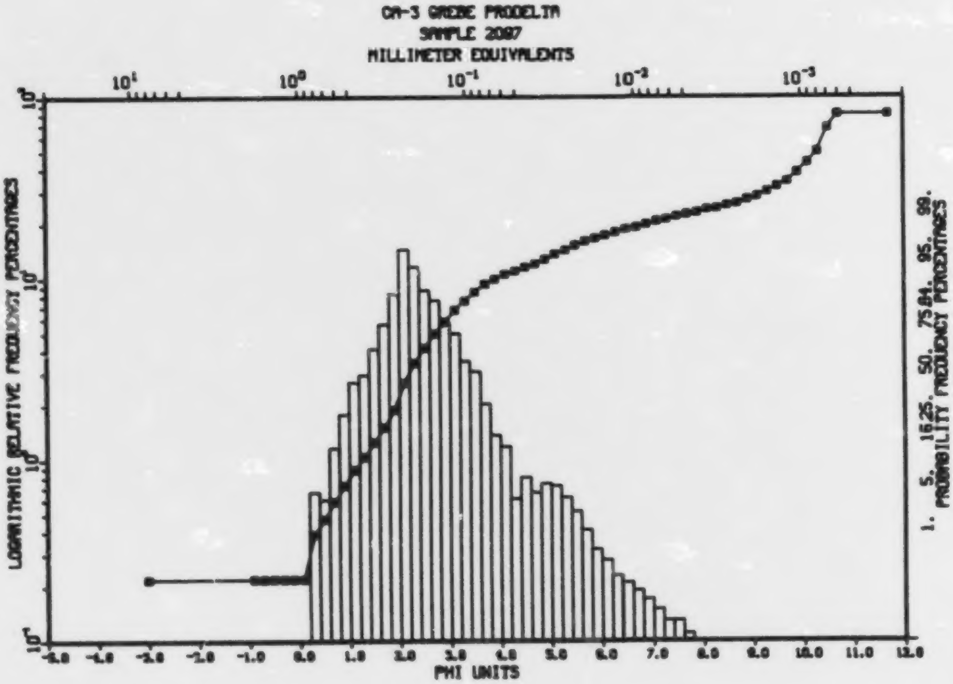
CA-13 SHOVELLER GRAB PRODELTA
SAMPLE 2084



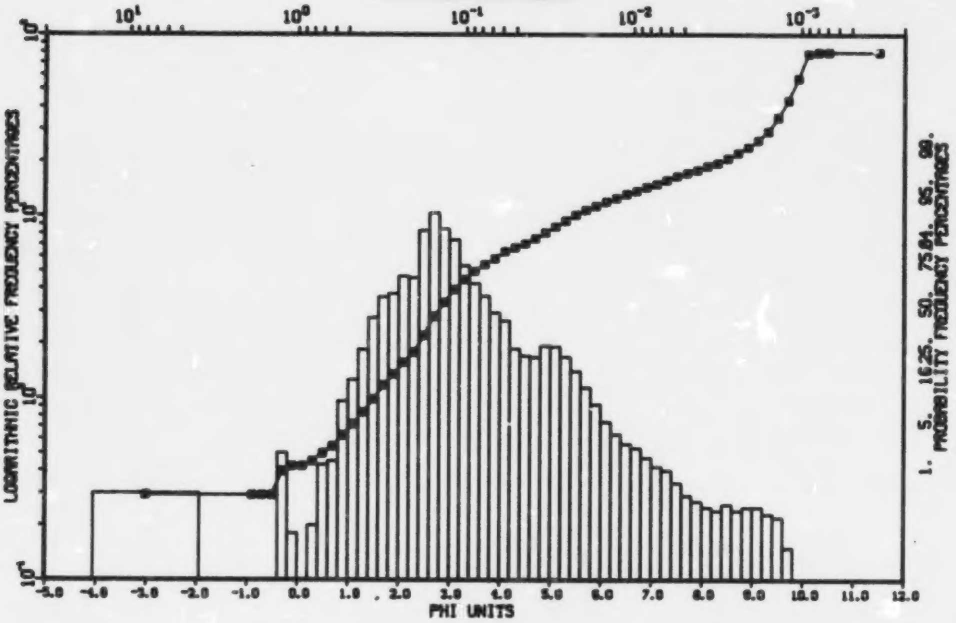
CA-1 GREBE GRAB PRODELTA
SAMPLE 2085



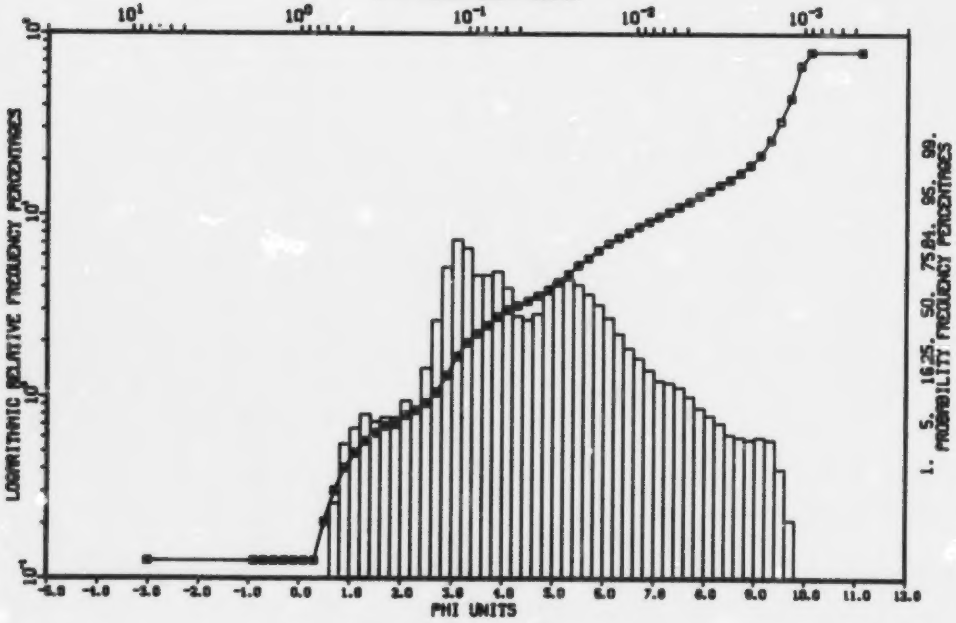

CA-2 GREBE GRAB PRODELTA
SAMPLE 2096
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1. 5. 16.25. 50. 75.84. 95. 99.
PROBABILITY FREQUENCY PERCENTAGES
-4.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS


CA-3 GREBE PRODELTA
SAMPLE 2097
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
1. 5. 16.25. 50. 75.84. 95. 99.
PROBABILITY FREQUENCY PERCENTAGES
-4.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

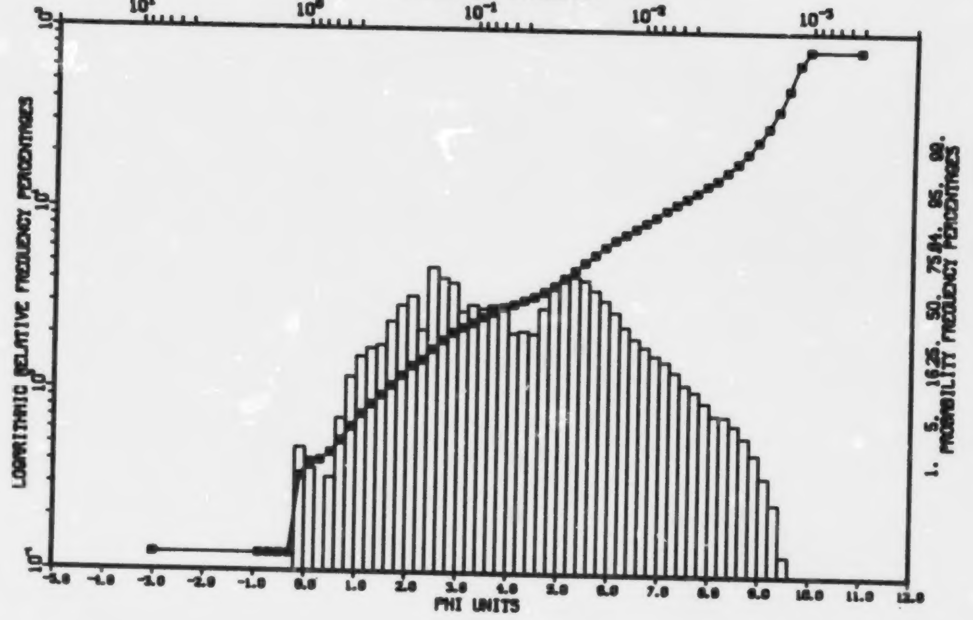
CA-4 GREBE PRODELTA
SAMPLE 2000
MILLIMETER EQUIVALENTS



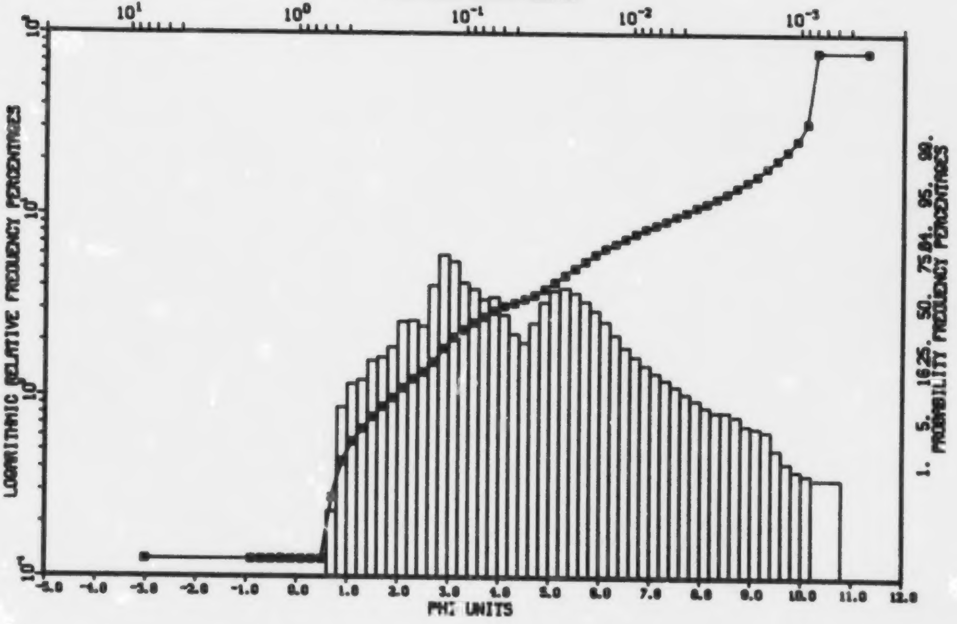
CA-5 GREBE PRODELTA
SAMPLE 2000
MILLIMETER EQUIVALENTS



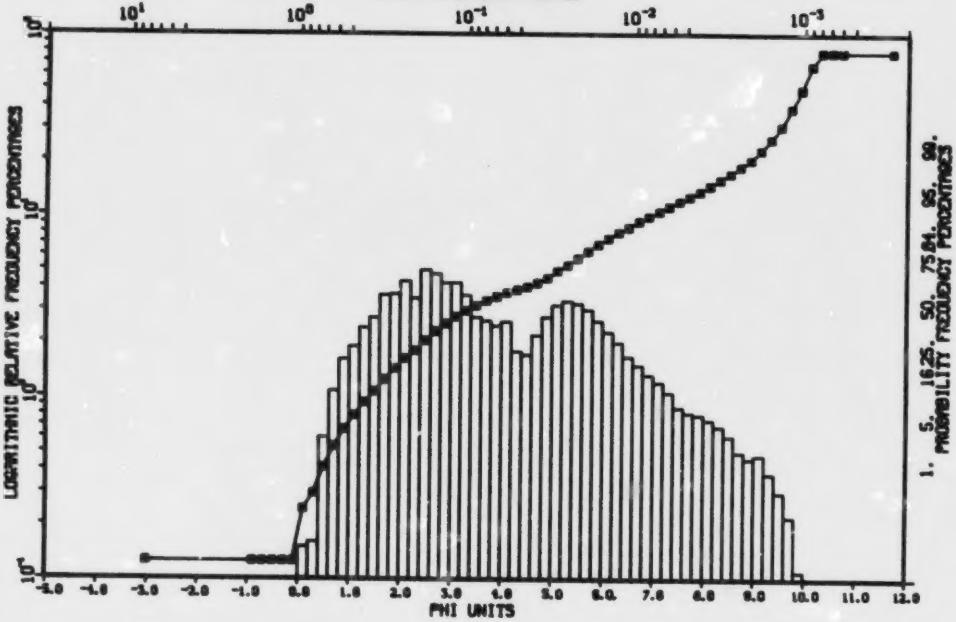
CA-6A GREBE GRAB PRODELTA
SAMPLE 2100
MILLIMETER EQUIVALENTS



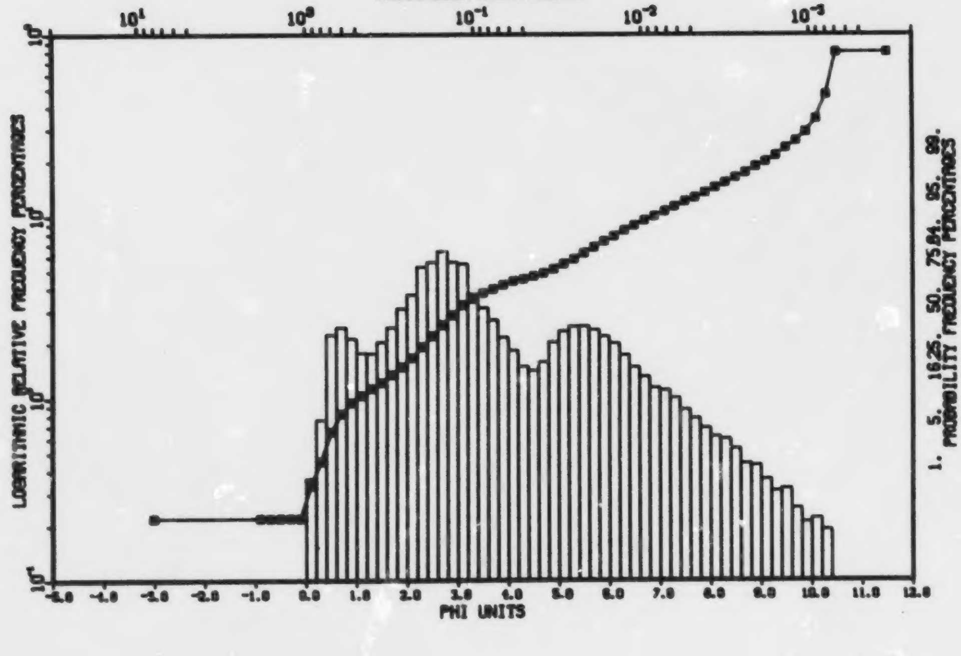
CA-6B GREBE GRAB PRODELTA
SAMPLE 2101
MILLIMETER EQUIVALENTS



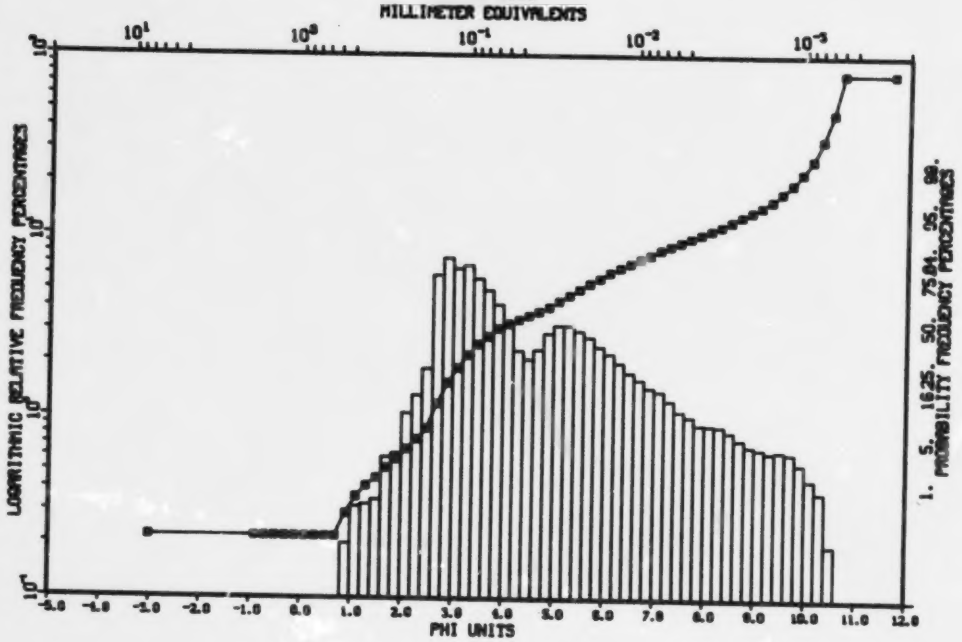
CA-7 GREBE GRAB PRODELTA
SAMPLE 2102
MILLIMETER EQUIVALENTS



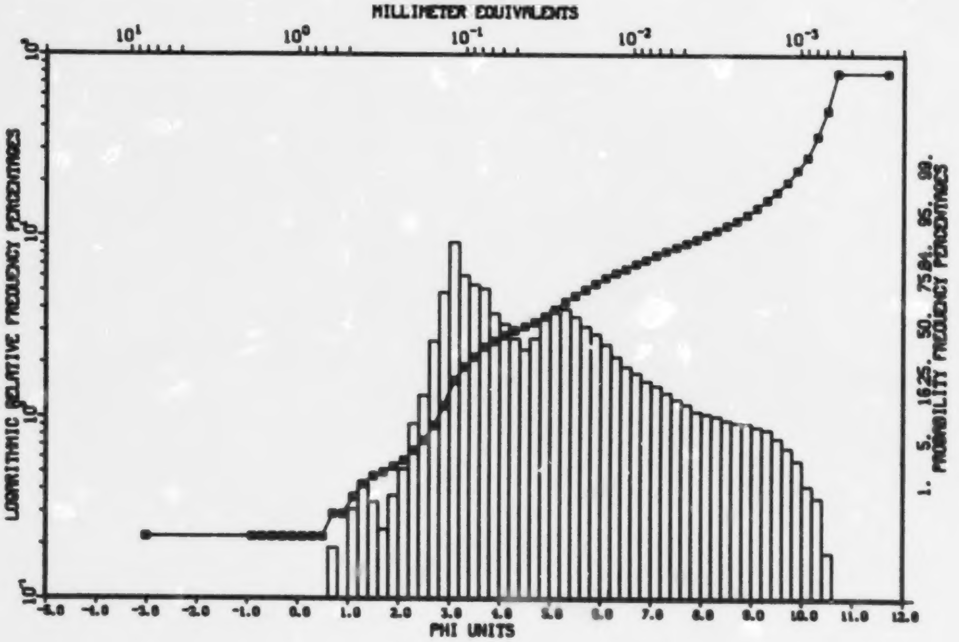
CA-8 GREBE GRAB PRODELTA
SAMPLE 2103
MILLIMETER EQUIVALENTS

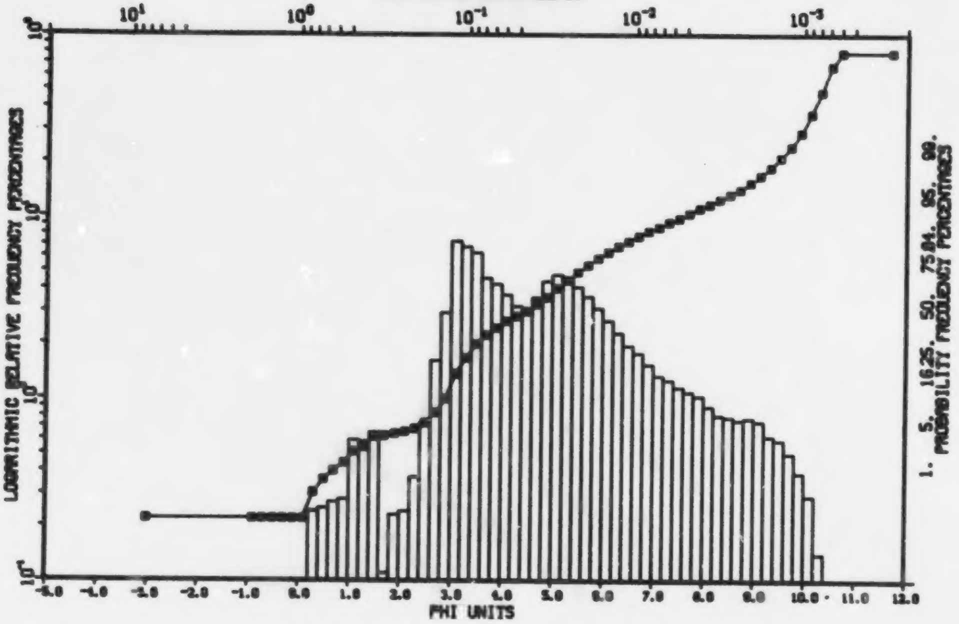


CA-9 GREBE GRAB PRODELTA
SAMPLE 2104

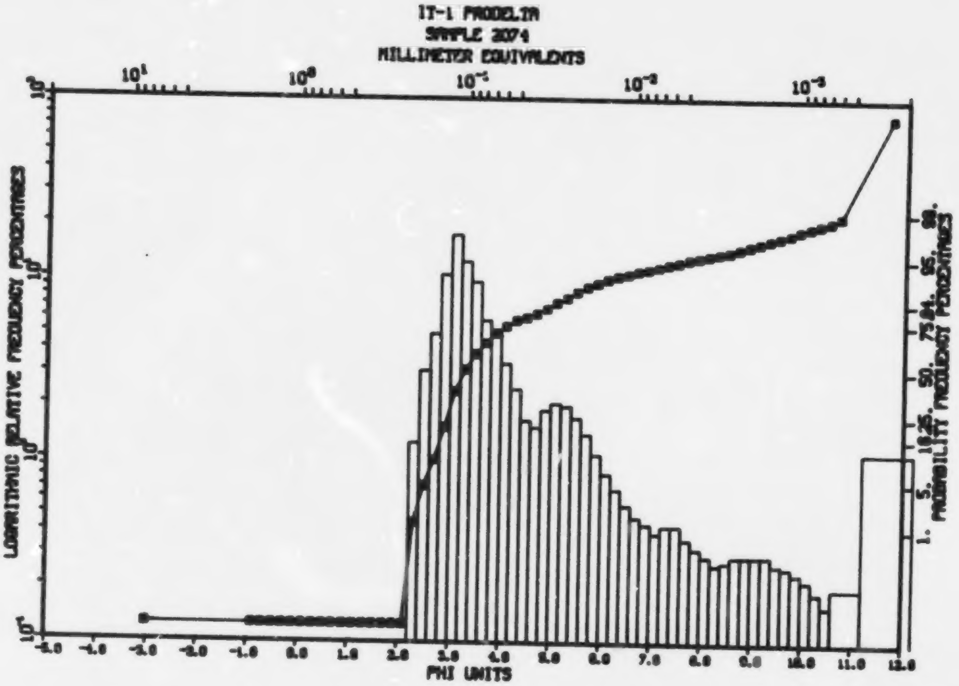


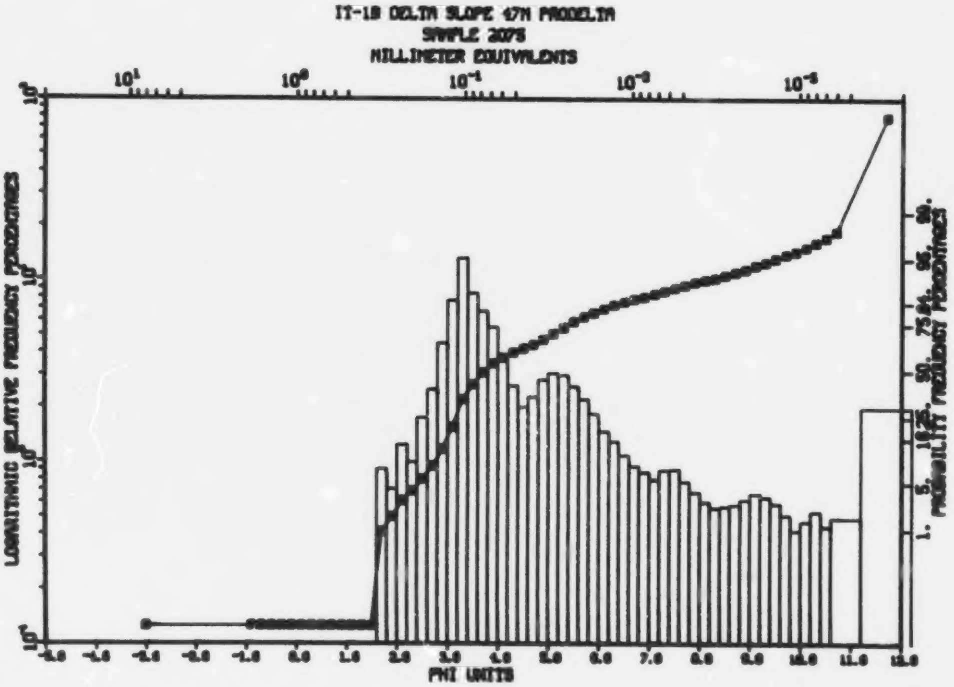
CA-10 GREBE GRAB PRODELTA
SAMPLE 2105



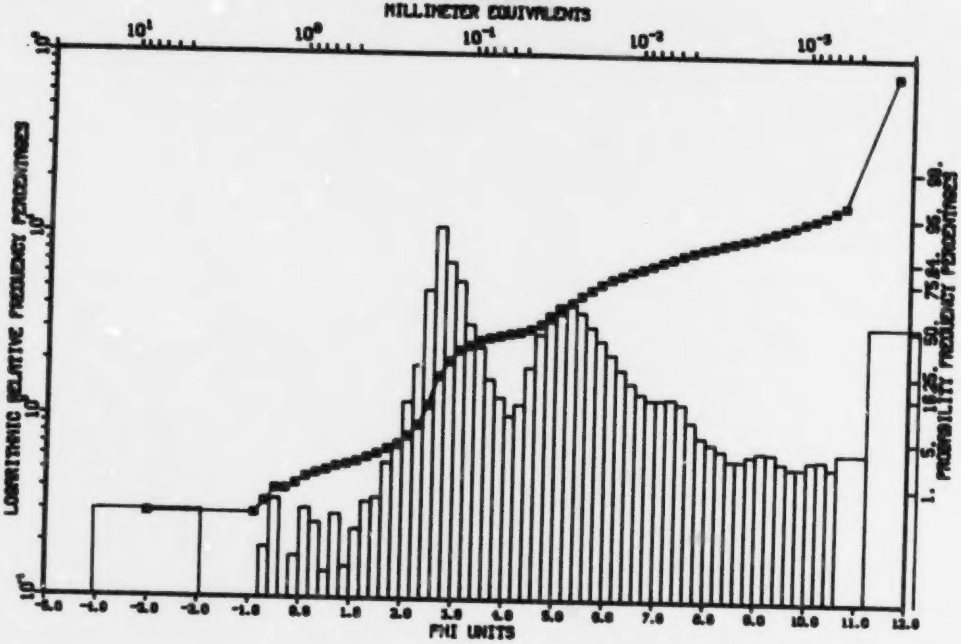


CA-11 GREBE GRAB PRODELTA
SAMPLE 2106

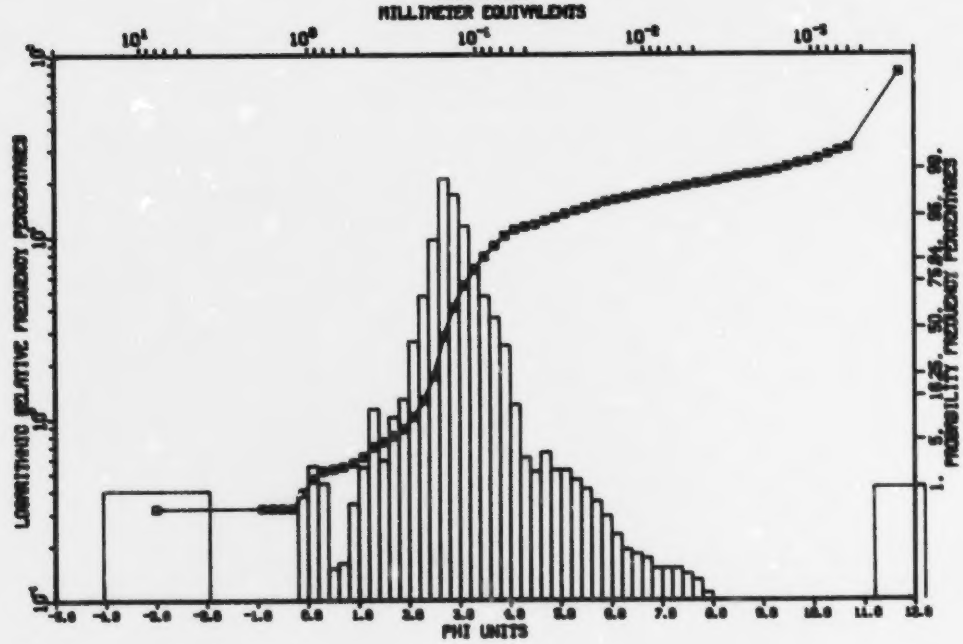

IT-1 PRODELTA
SAMPLE 2074
MILLIMETER EQUIVALENTS
10^1
10^0
10^-1
10^-2
10^-3
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^-1
10^0
10^1
10^2
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-3.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

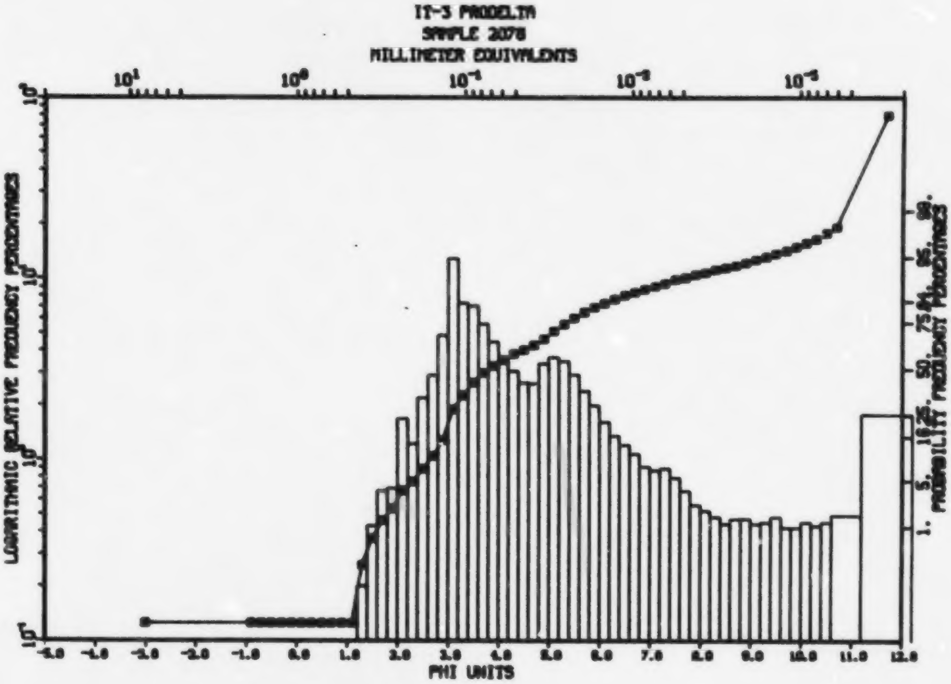

IT-18 DELTA SLOPE 47M PRODELTA
SAMPLE 2075
MILLIMETER EQUIVALENTS
10^1
10^0
10^-1
10^-2
10^-3
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^-1
10^0
10^1
10^2
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-3.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

IT-2 PRODELTA
SAMPLE 2076

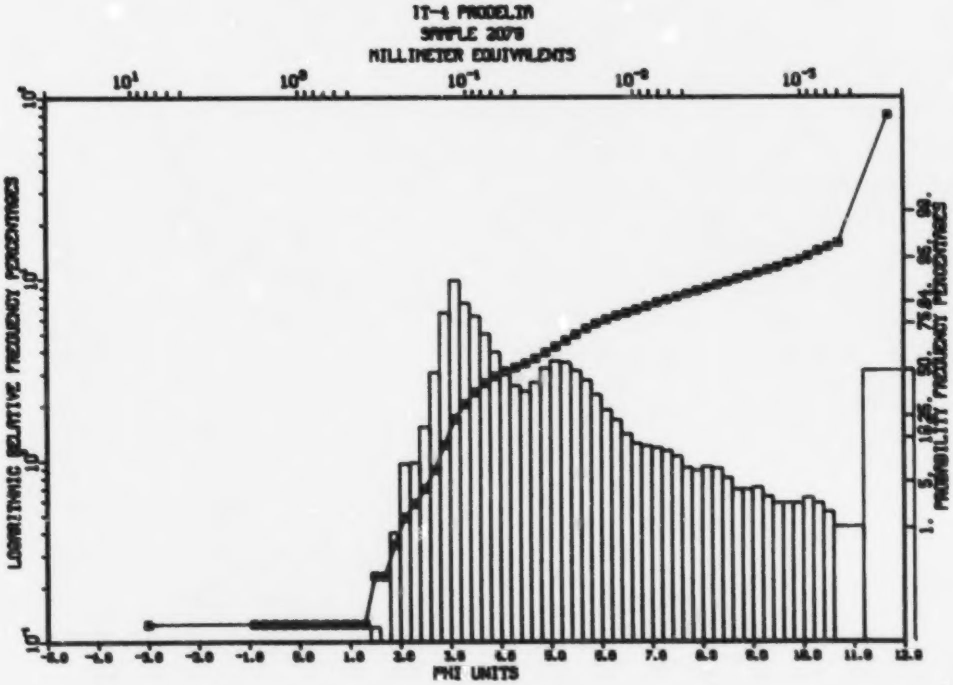


IT-2B DELTA SLOPE CHANNEL 38M
SAMPLE 2077

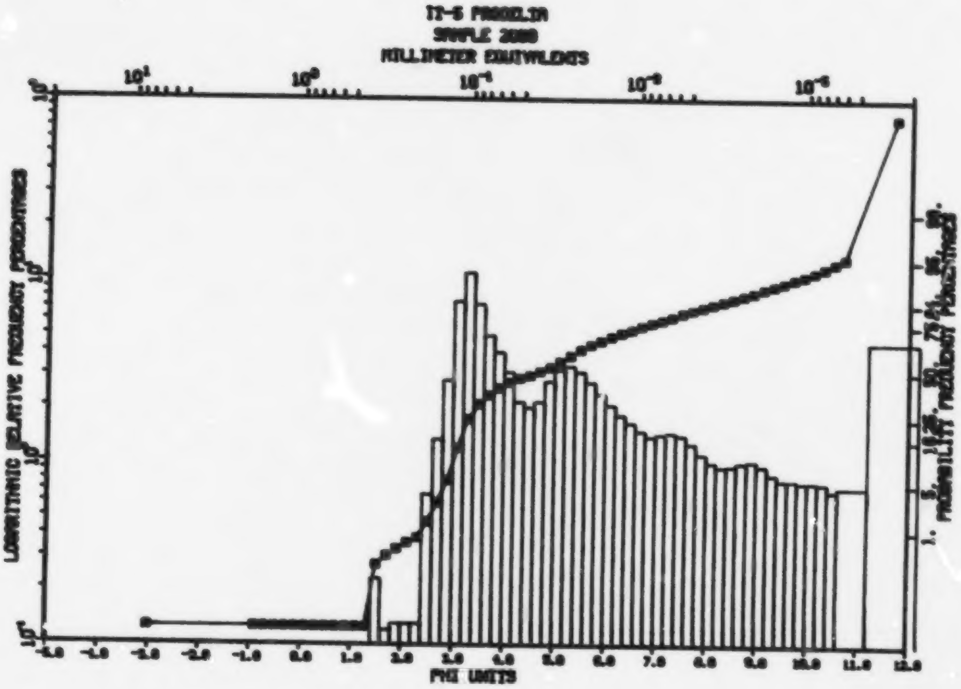


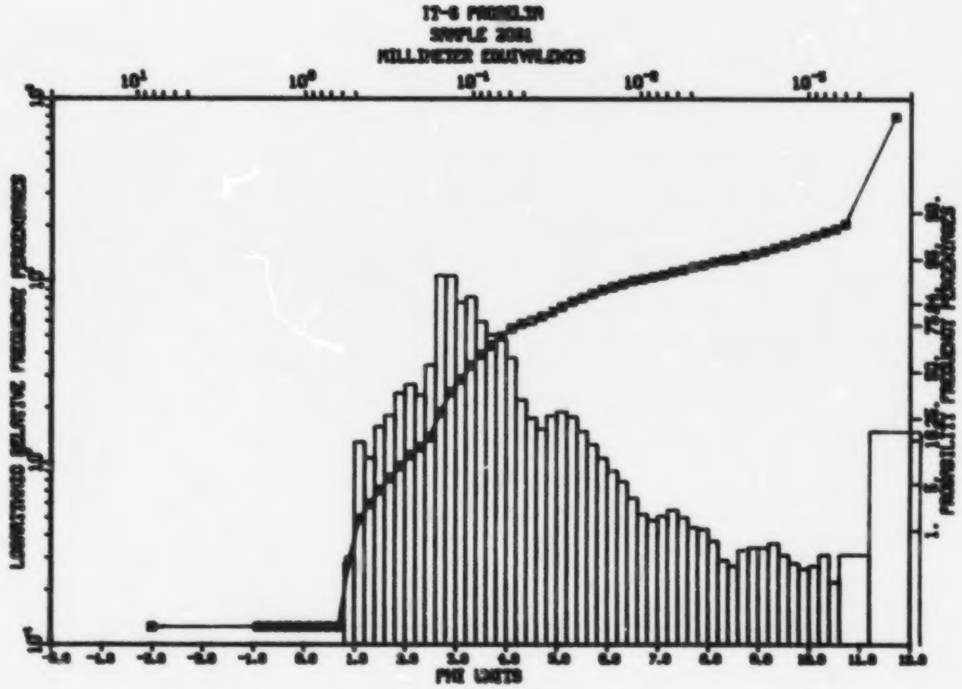


IT-3 PRODELTA
SAMPLE 2078
MILLIMETER EQUIVALENTS

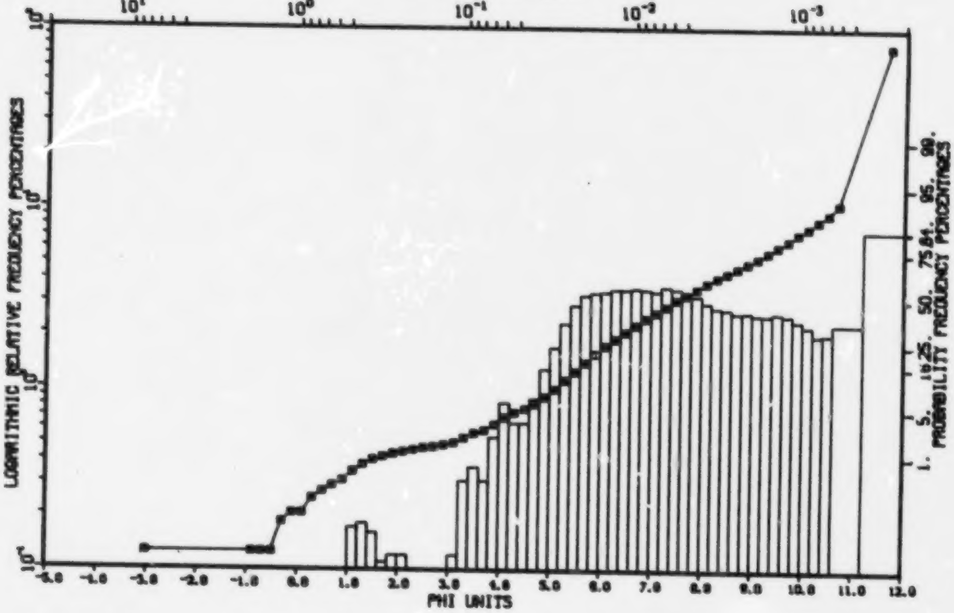


IT-4 PRODELTA
SAMPLE 2079
MILLIMETER EQUIVALENTS

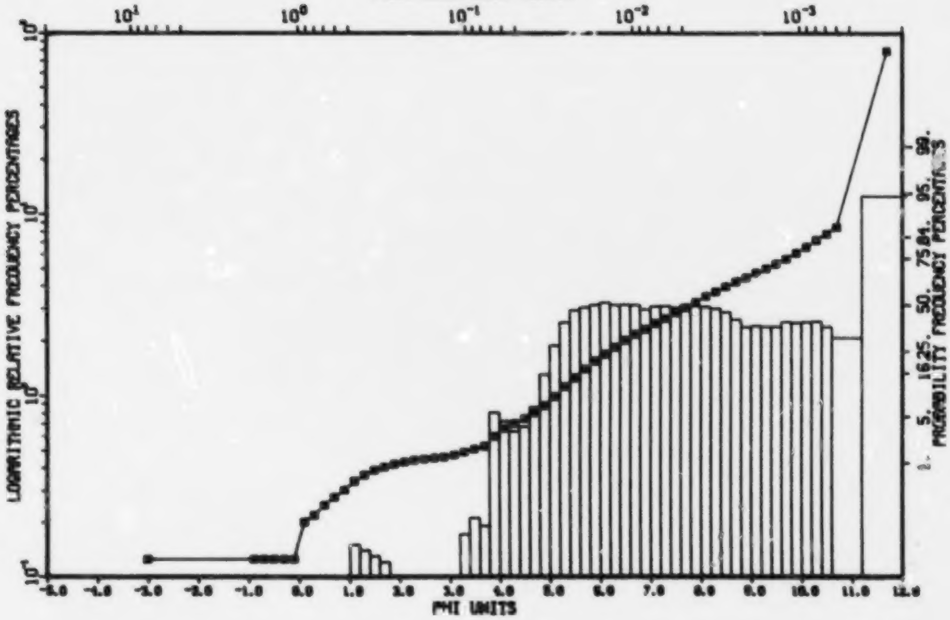

IT-6 PRODELTA
SAMPLE 2080
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
90.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

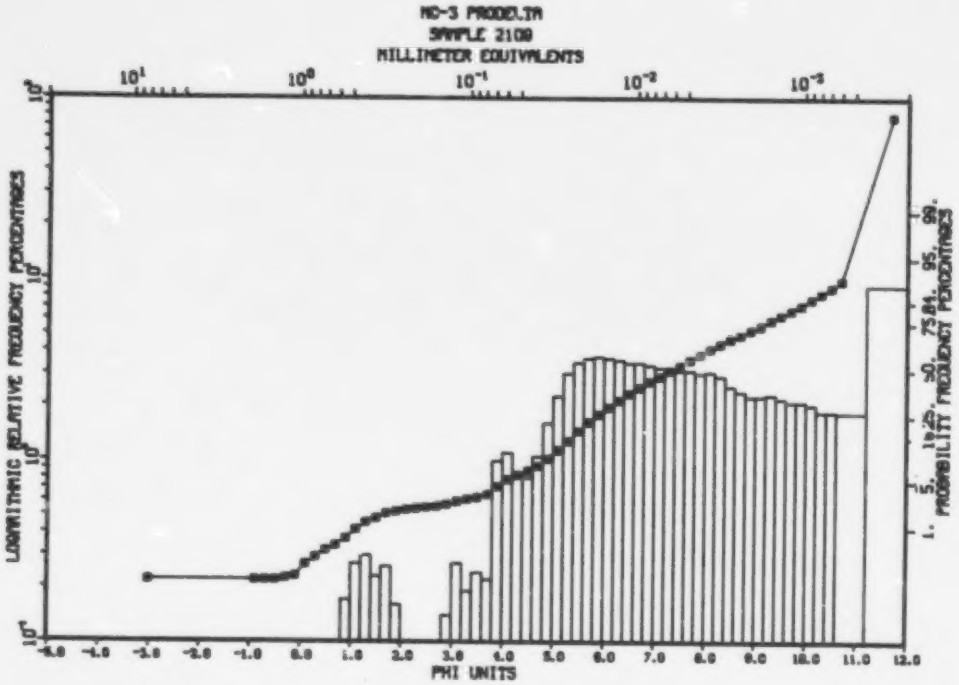

IT-6 PRODELTA
SAMPLE 2081
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
90.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

MD-1 PRODELTA
SAMPLE 2107
MILLIMETER EQUIVALENTS

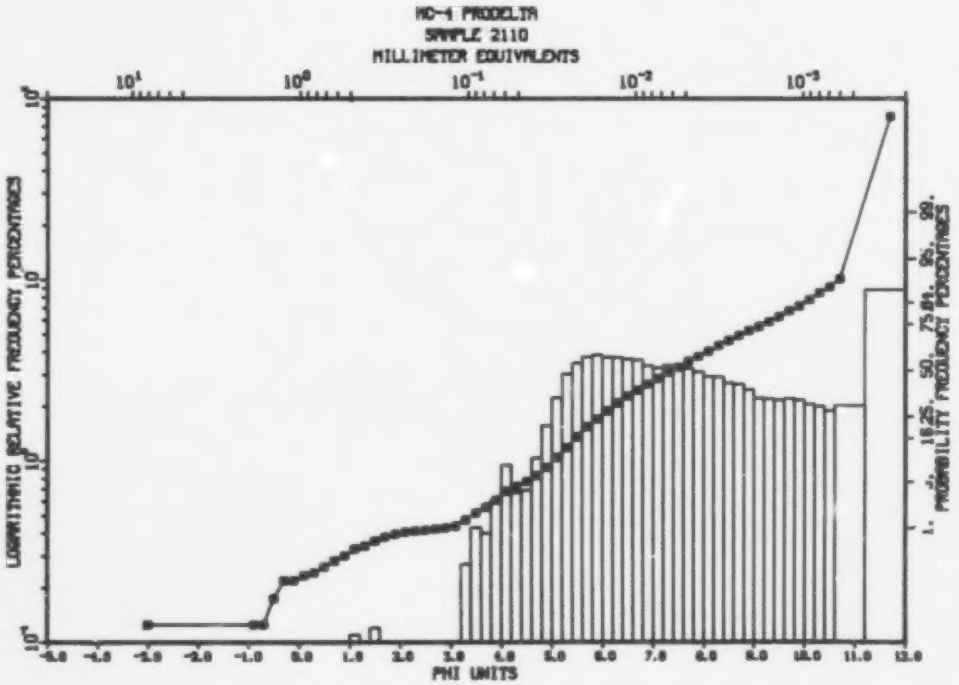


MD-2 PRODELTA
SAMPLE 2108
MILLIMETER EQUIVALENTS

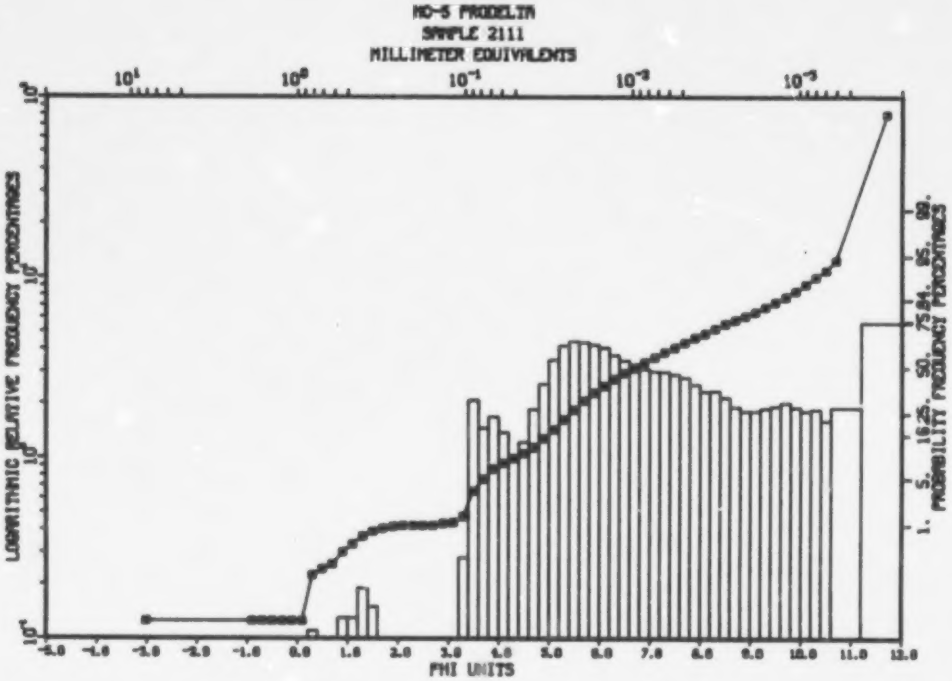


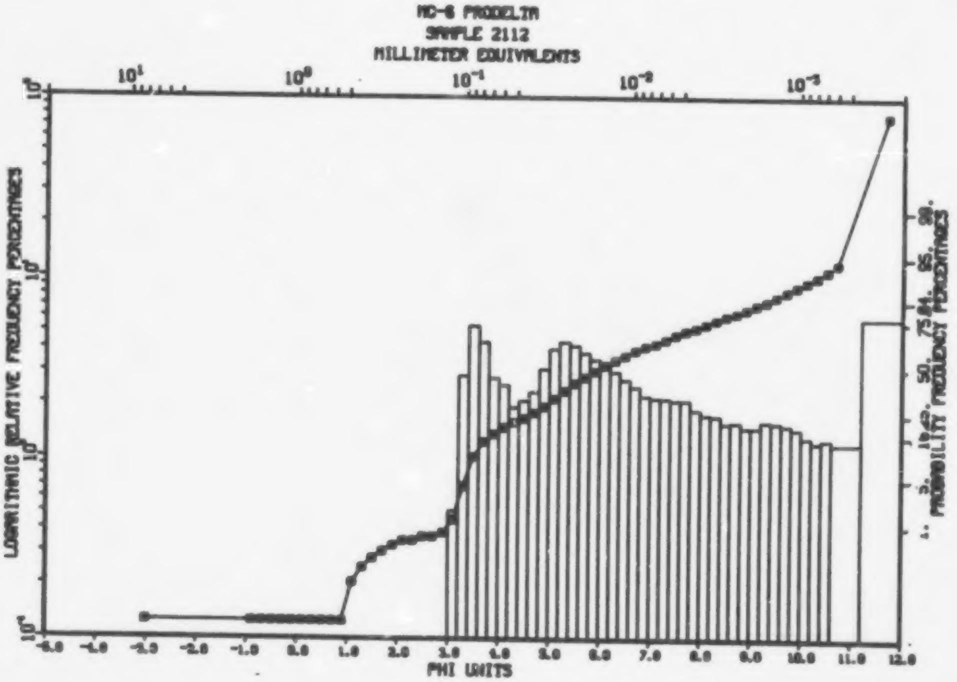


MC-3 PRODELTA
SAMPLE 2109

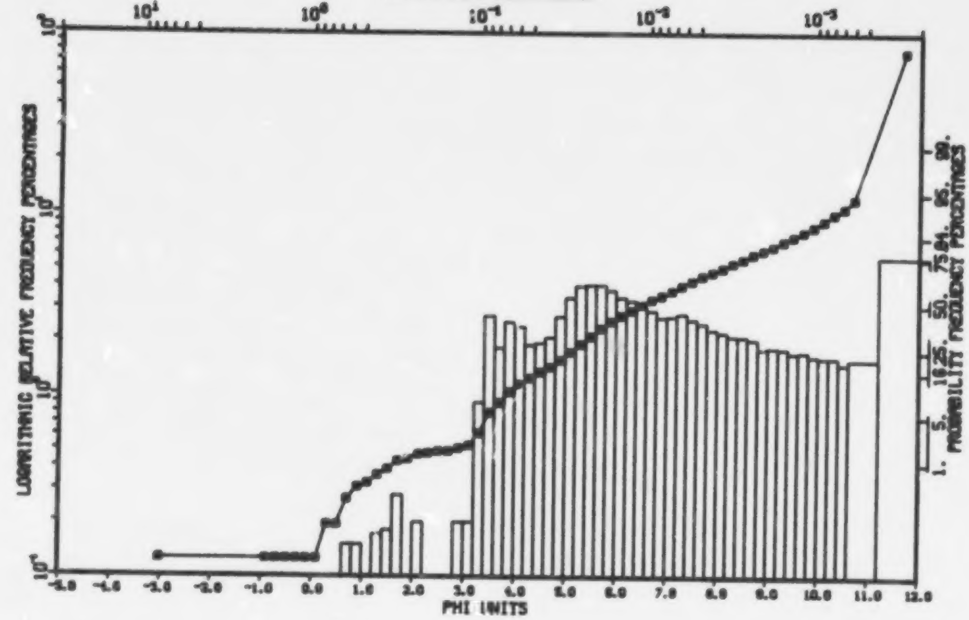


MC-4 PRODELTA
SAMPLE 2110


MC-5 PRODELTA
SAMPLE 2111
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


MC-6 PRODELTA
SAMPLE 2112
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

MC-7 PRODELTA
SAMPLE 2113
MILLIMETER EQUIVALENTS



MC-8 PRODELTA
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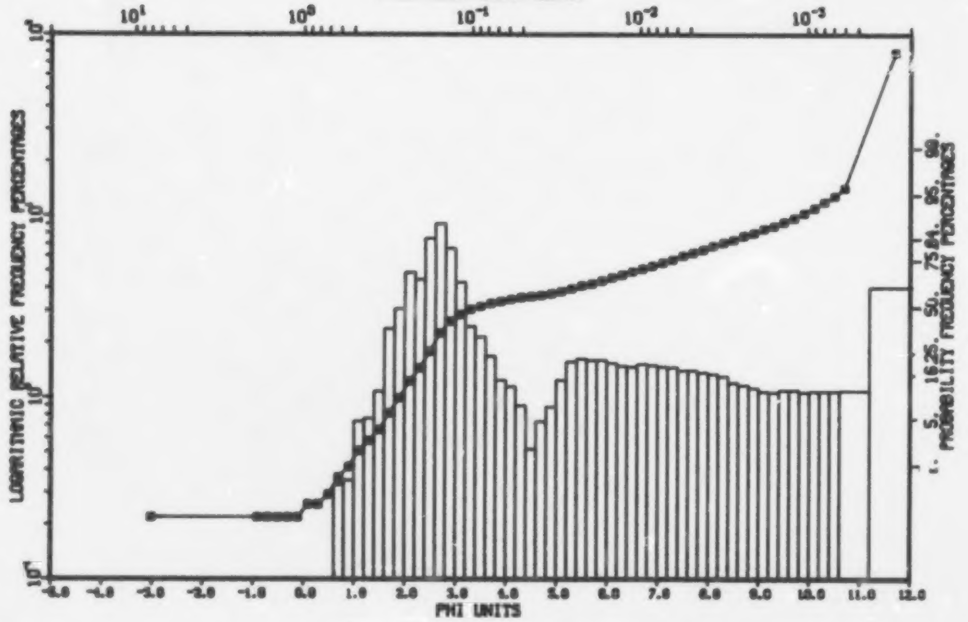

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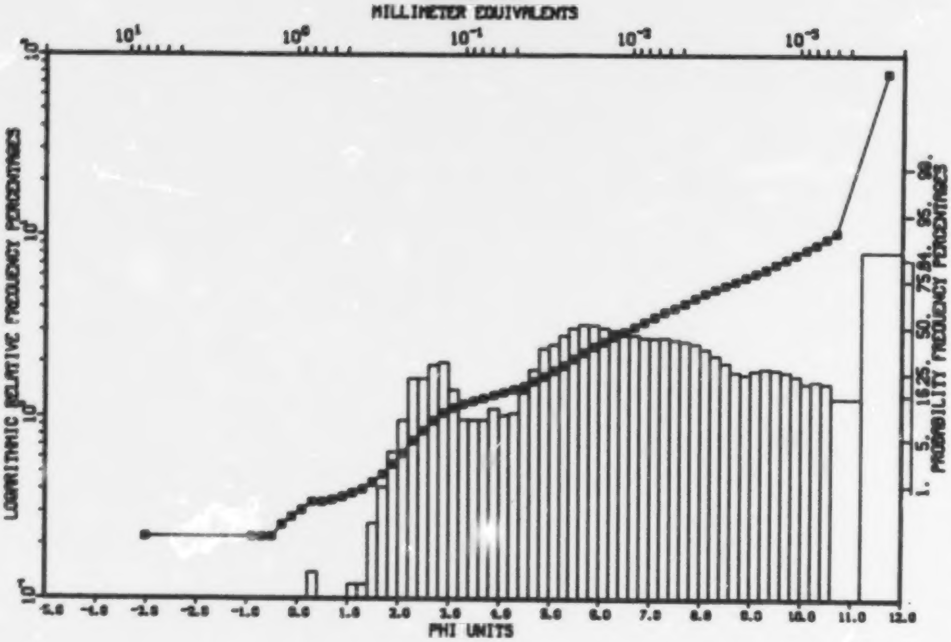

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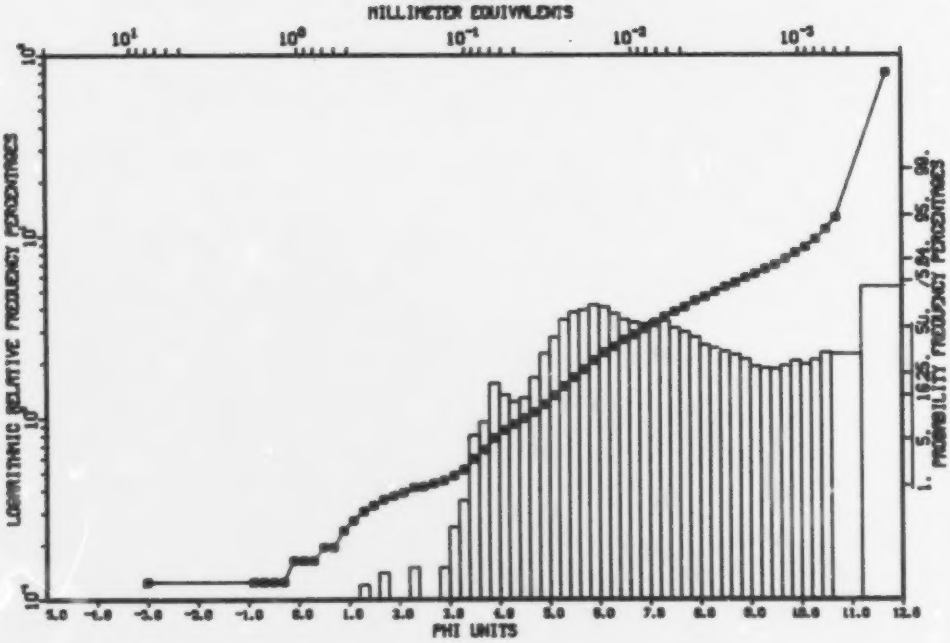

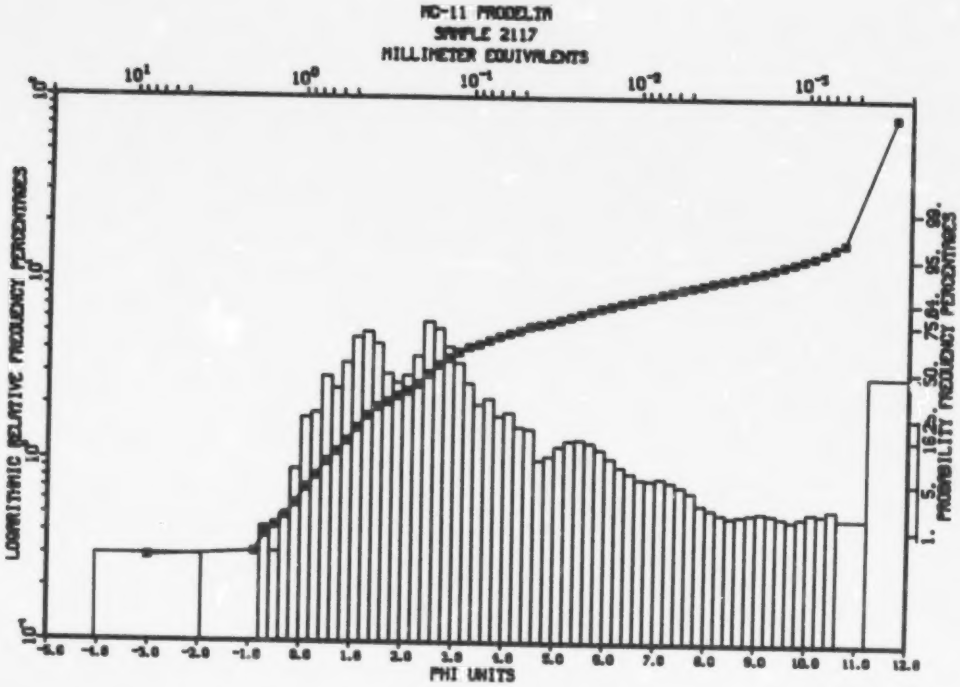
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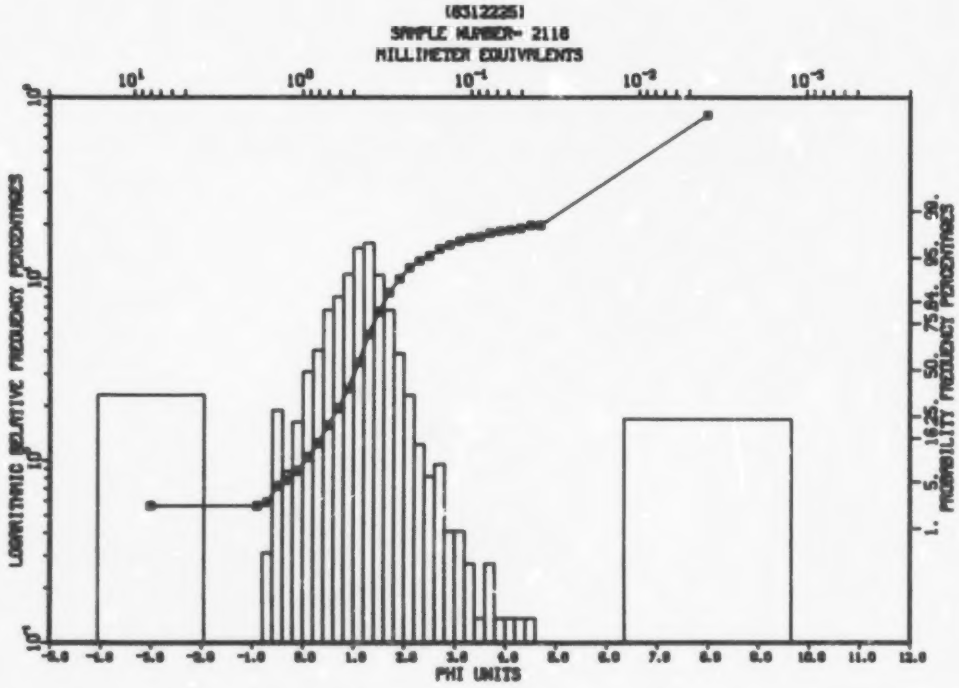
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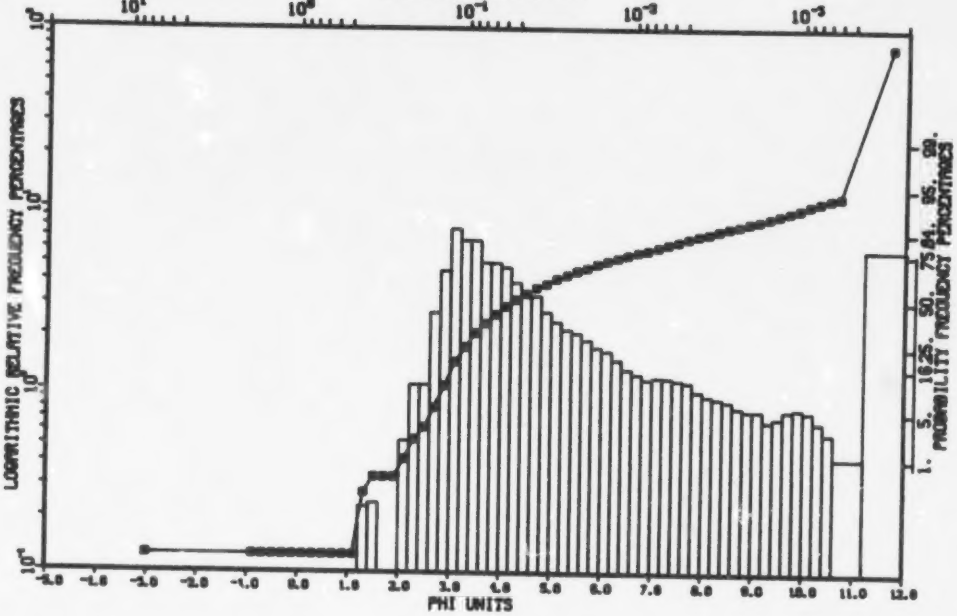

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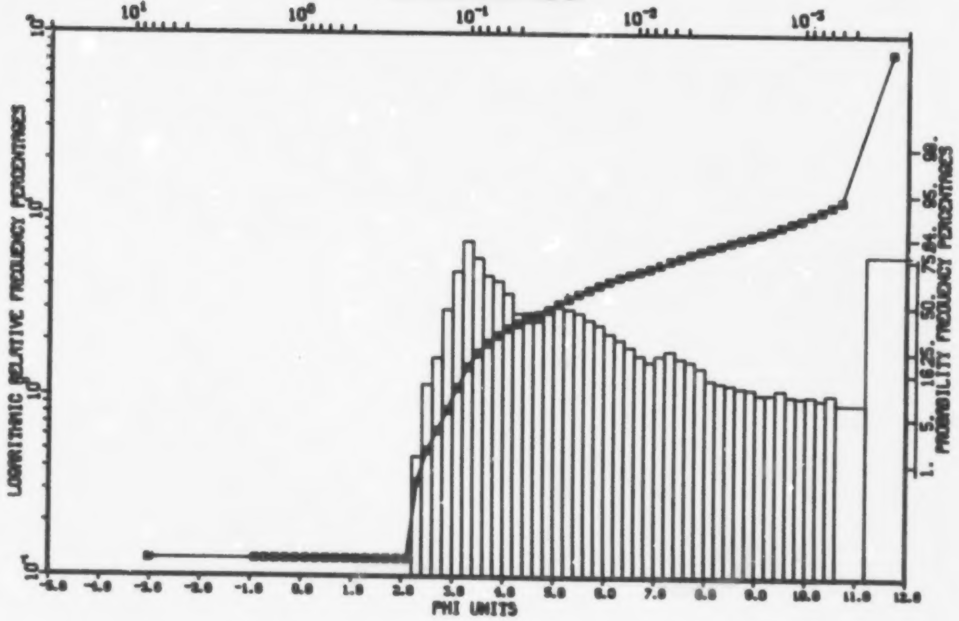

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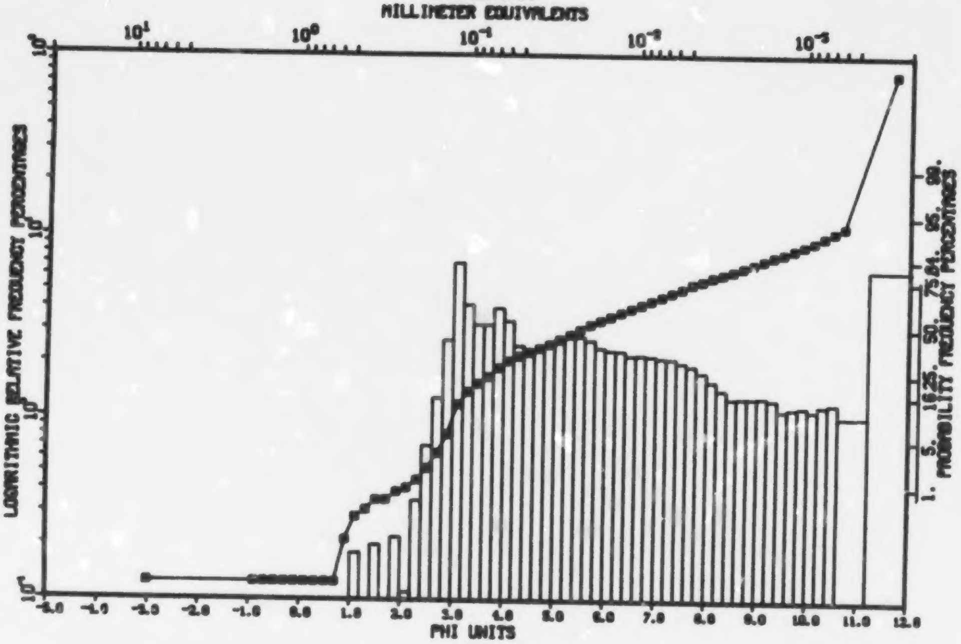
MILLIMETER EQUIVALENTS

MC-14 PRODELTA
SAMPLE 2121



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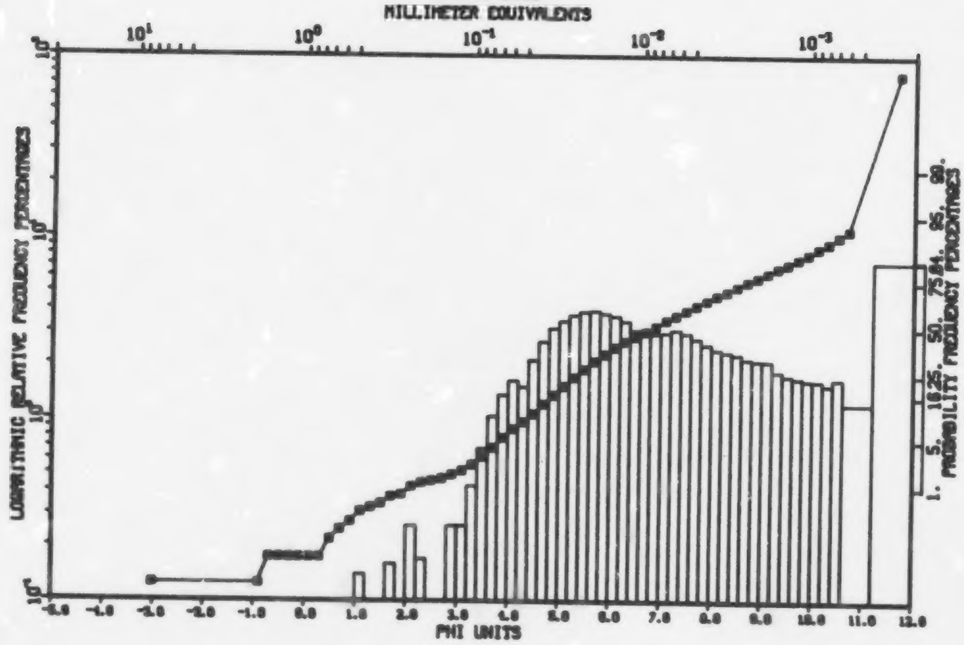

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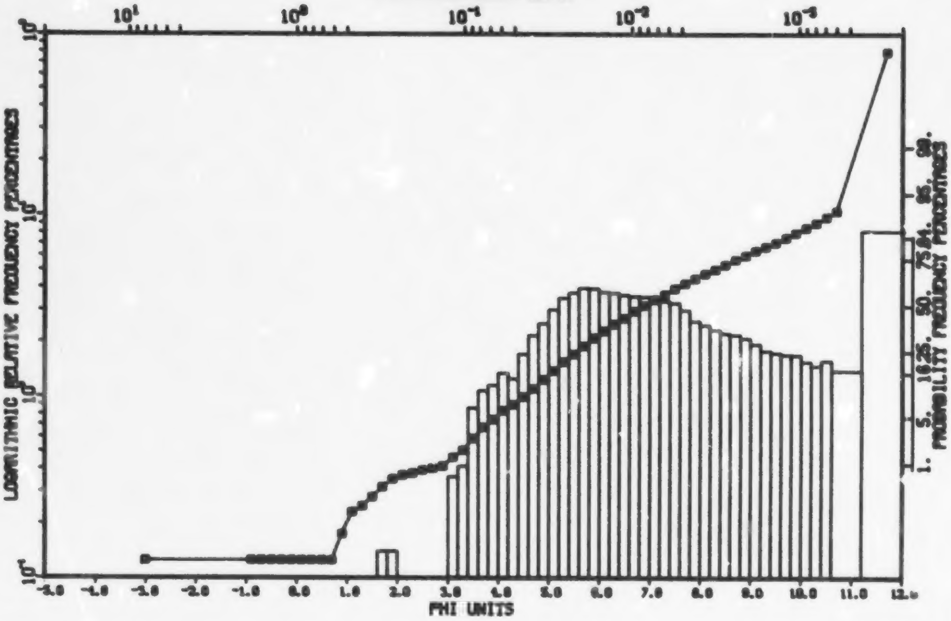
MILLIMETER EQUIVALENTS



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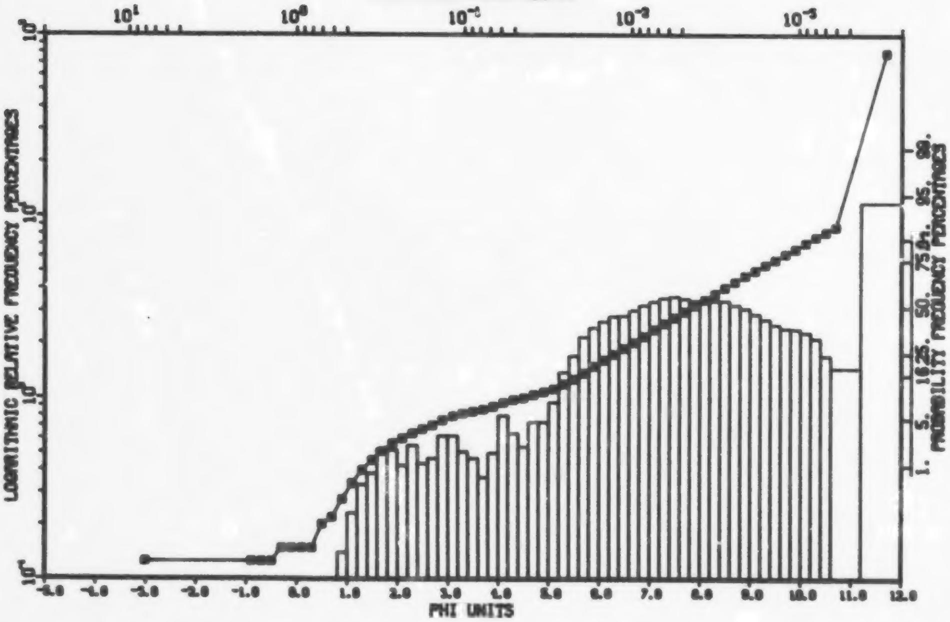

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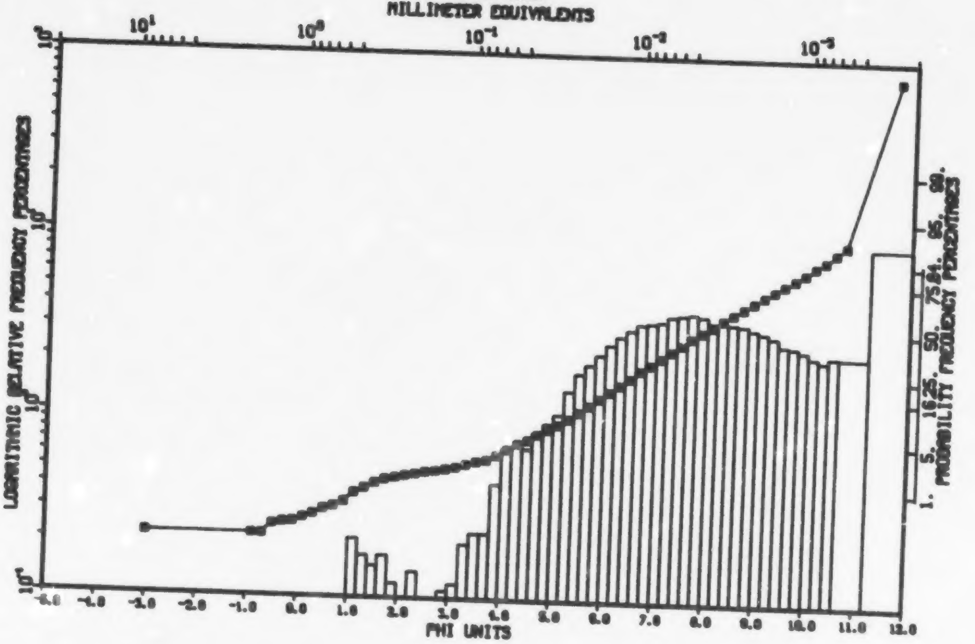

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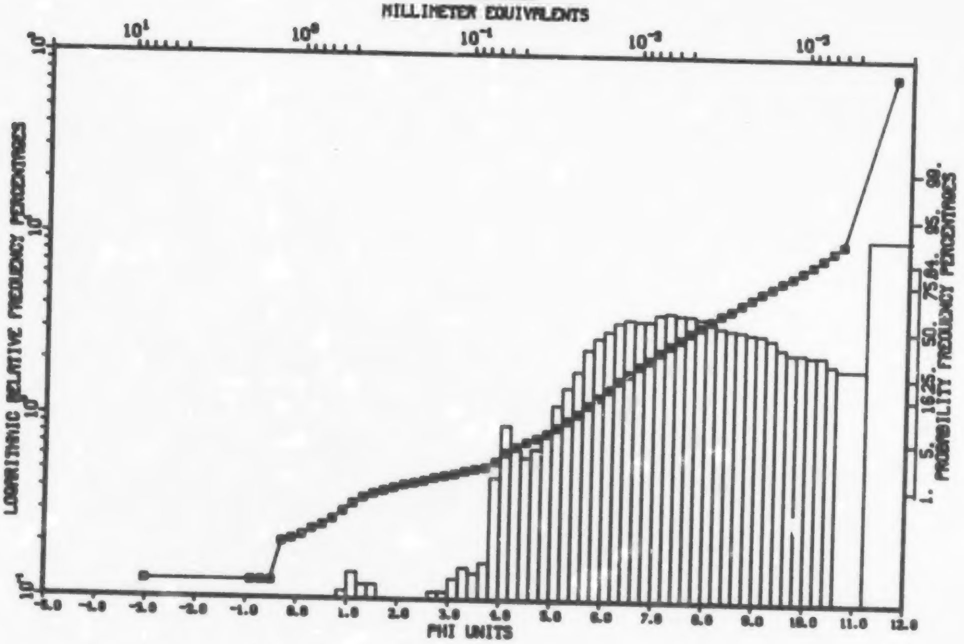

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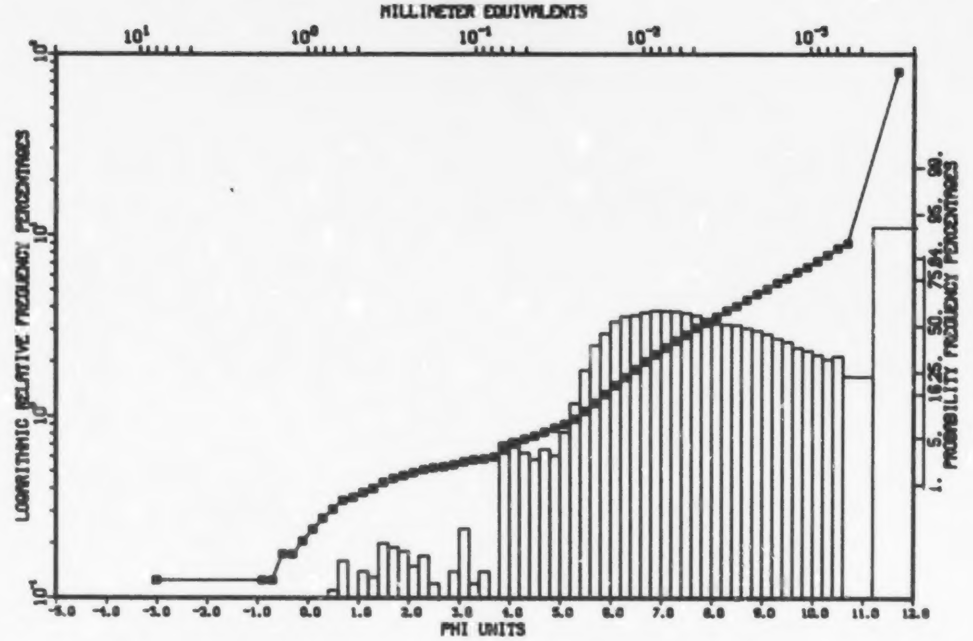

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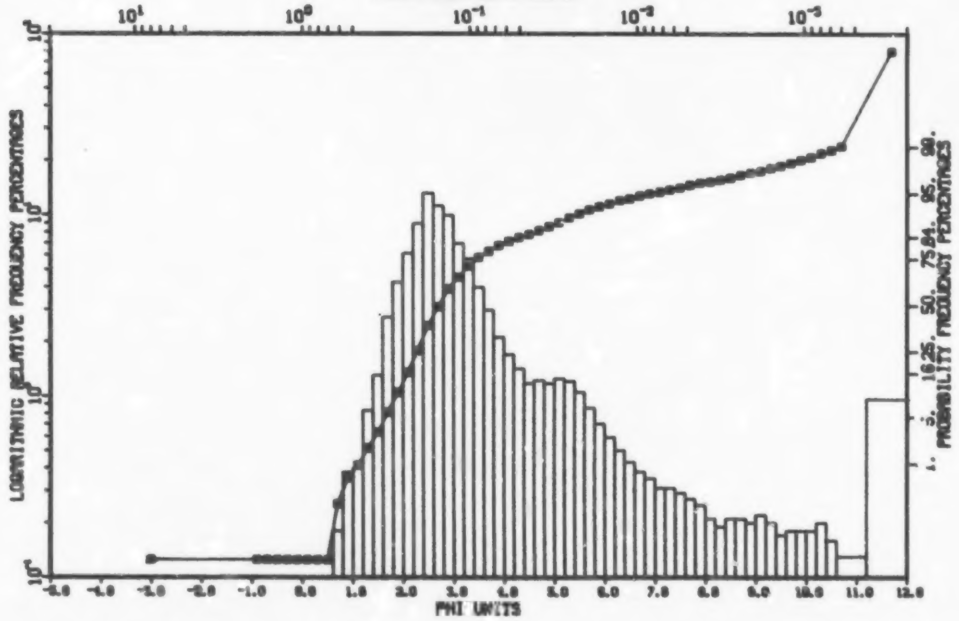

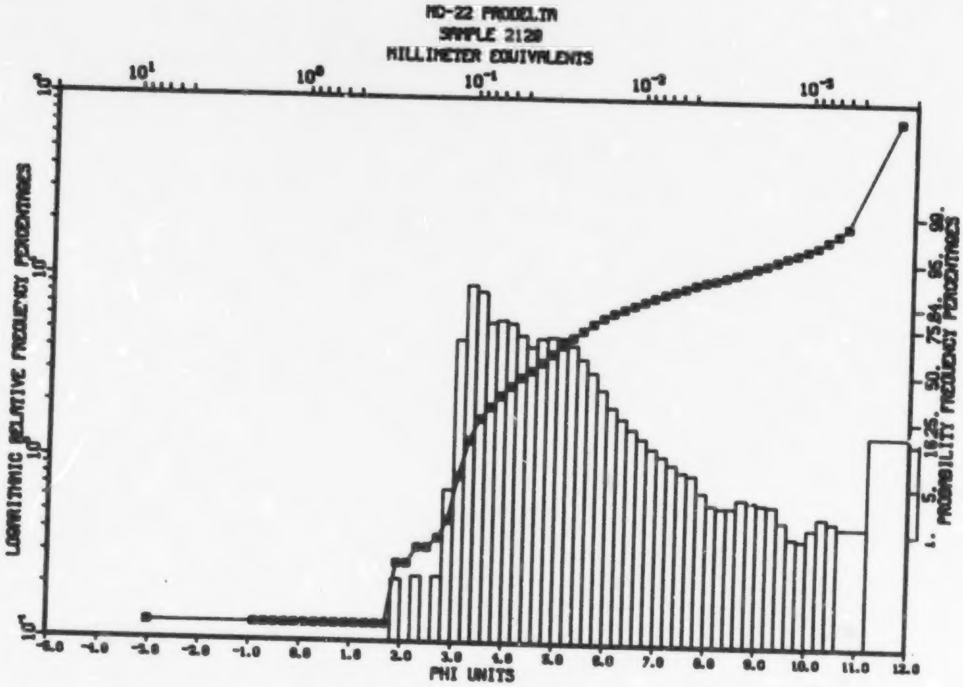
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SAMPLE 2120
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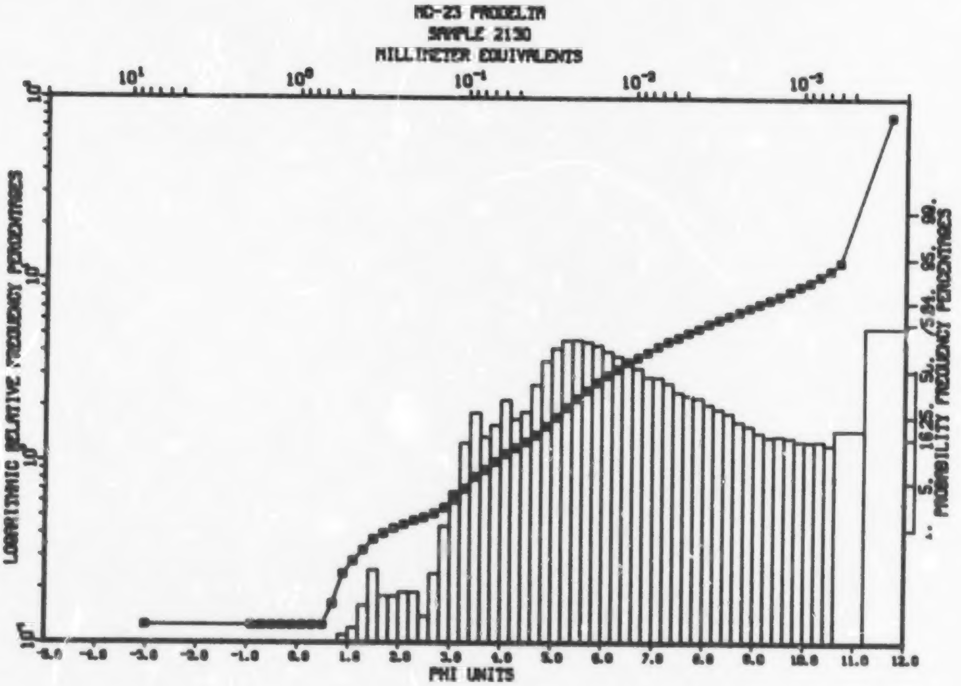
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


MD-23 PRODELTA
SAMPLE 2130
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
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12.0
PHI UNITS

SAFE: 1983 Delta Survey Report

by

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Objective

1. To determine the freshwater input to SAFE fjords.

2. To determine whether the freshwater input is from summer rain, nival freshet or glacier ice melt.

3. Using cycling factors to produce a synthetic discharge curve for the Keel River, Cambridge Fiord, based on average climate conditions.

4. Using the morphology character of the Keel River, calculate bedload transport; based on the abundance of ice fields predict the suspended load.

5. Describe the land base surveys of the Baffin sandurs.

6. Describe the sediment texture from samples collected during the land base surveys.

Methods

1) Eleven fjords were subdivided into a number of hinterland drainage basins. The basins as shown in Figure 1 were chosen for either containing one major (rel.) river system or for containing similar hinterland conditions (presence or lack of ice fields etc.). Summer precipitation is based on 30-year averages (1951-1980 Canadian Climate Normals from A.E.S. Environment Canada) of rainfall between June 15 and September 15. Winter precipitation is based on snow accumulation between September 15 and June 15. In both cases, the data for a particular drainage basin was estimated from linear interpolation of A.E.S. contoured data (Fig. 2). Climate data for Baffin Island comes from the following weather stations: Arctic Bay, Pond Inlet, Clyde, Rowley Is., Longstaffe Bluff, Dewar Lakes, Cape Hooper, Broughton Is., Padloping Is., Cape Dyer, Brevoort Is., Frobisher and Resolution Is., In addition, data from Church (1972) Østrem et. al. (1967) and unpublished CGB data was consulted.

2) The first assumption was that precipitation falls evenly within a hinterland with basin features averaging each other out. Our concern using A.E.S. data is that elevation-caused variations in precipitation has yet to be corrected.

   The average summer freezing level (SFL) was estimated as 200m less than the maximum summer conditions given by Miller et. al. (1975). Corrections for evaporation and/or condensation were considered fairly small (see Østrem et. al, 1967). Thus the second assumption is that the summer precipitation runoff is equal to the total summer precipitation that falls below this adjusted SFL position.

The average elevation for a glaciers equilibrium position, ELA, was interpolated from the contoured data of Andrews and Miller (1972). Their given equilibrium line altitudes are considered steady state reflecting the climate during the last couple of decades and therefore relative to the A.E.S. climate normals.

Thus based on 1:250,000 Canadian E.M.R. topographic maps, the following information was obtained (with the aid of a digitizing table):

t = total basin area
c = total non-glaciated area
g = total glaciated area above the ELA
G = total glaciated area below the ELA
B = total glaciated area
a = area above the SFL
A = area below the SFL

All pertinent information is provided in Table 18.1. The following relationships were considered appropriate for calculating discharge components:

$$Qr = A * S$$
$$QN = C * W + G * W$$
$$QI = g * (W + (S * a))$$
$$QT = T * t = Qr + QN + QI$$

where Qr is the summer rain runoff
QN is the nival freshet
QI is the glacier melt runoff
QT is the total runoff
S is the summer precipitation
W is the winter precipitation

Table 18.1 gives these values for each of the drainage basins.

3) Cycling involves the number of modes and size (duration) that a particular discharge component must be segmented by. For instance, QN is made to occur in the spring as one standard mode, skewed towards the summertime. The duration depends on the hypsimetric integral, basin area and the number of lakes (all of which work to delay or spread QN over a longer time interval). For useful background data see Gilbert and MacLean (1983). QI is made to occur only after QN is complete and is cycled by the number of clear days with positive temperatures. In the absence of reliable AES cloud cover data, degree days above 10°C will be used (Fig. 3). The modes are distributed by these monthly values with two modes per month. Qr is set to never overlap with QI (not strictly true) and occurs only after QN is mostly complete and cycled by the number of significant summer precipitation events (a value derived from Figures 4 and 5).

One event was given a value equivalent to 50% of the greatest rainfall in 24 hours (Fig. 3), and occurred in the month of highest standard deviation in rainfall. Figure 6 is an example of a synthetic discharge curve for the Keel River delta at the head of Cambridge Fiord. Note that a base flow of $1.8 m^3 s^{-1}$ was maintained throughout the runoff season. The value was arrived at by distributing 10% of the total annual runoff over the discharge season. The percentage value was set to increase by 3% for each 10% increase in drainage basin lakes.

4) The suspended load (Qs) may be calculated using an order-of-magnitude type rating curve. Østrem et. al. (1967) found that Qs to be approximated by 1.6×10^5 kg km^{-2} for the Decade Glacier River, Inugsuin Fiord. Church (1972) found Qs to vary approximately with the square of the discharge for hinterlands not dominated by ice melt and rising to the cube of the discharge (Q) for hinterlands dominated by ice fields. For our model we use the following algorithms:

for <30% basin with ice fields:

$$Qsi = (Qi)^2 \, (10^{-3})$$

$$\overline{Q} \quad \frac{\sum_{c=1}^{n} (Qi)^2 \, (10^{-3})}{n} = \left(\frac{QT}{T}\right)^2 (10^{-3})$$

$$QST = (\overline{Q}s)T$$

where Qi is the instantaneous discharge, $m^3 s^{-1}$

Qsi is the instantaneous suspended load, kg s^{-1}

T is the length of discharge season, 6.9×10^6S

$\overline{Q}$s is the average suspended load

QST is the total (mean annual) load of suspended sediment

QT is the total yearly discharge

for between 30 to 60% ice fields:

$$Qsi = (Qi)^{2.5} \, (1.8) \times 10^{-3})$$

$$\overline{Q}s = \frac{\sum_{c=1}^{n} (Qi)^{2.5}) \, (1.8 \times 10^{-3})}{n}) = \left(\frac{QT}{T}\right)^{2.5} (1.8 \times 10^{-3})$$

for >60% ice fields:

$$Qsi = (Qi)^3(5X10^{-3})$$

$$\overline{Qs} = \frac{\sum_{c=1}^{n} (Qi)^3 (5 \text{ X } 10^{-3})}{n} = \left(\frac{QT}{T}\right)^3 (5 \text{ X } 10^{-3})$$

Results for the annual suspended load transported down the rivers for the individual basins (Fig. 18.1) are given in Table 18.2. Table 18.3 groups the results in terms of both fjord-head input and total input. The Penny ice cap fjords North Pangnirtung, Coronation and Maktak are similar in that between 95% to nearly 100% of the suspended load enters the fjord at its head. On the other extreme are the fjords of Clark, Tingin and Inugsuin that have less than 10% of the suspended load entering through their head.

The bedload was calculated (for only the Keel River in this report) using both Einstein's (1950) equations and Bagnold's (1966) equations. Einstein's equations are based on the parameters of grain size, hydraulic radius and slope and are independent of river discharge.

Bagnold's equations are based on bed slope, river discharge, transport efficiency (i_6) and a friction factor [tan(f)], and are independent of channel width, channel depth and particle diameter. Theodilite surveys of the lower reaches of the Keel River and McBeth River provided the necessary input data for these equations (Fig. 18-7 and Fig. 18-8). Based on the Bagnold equations for bedload transport, Figure 18-6 gives the predicted bedload transport for the synthetic Keel R. discharge curve. The critical discharge to which sediment motion begins was choosen as 10 m^3s^{-1}: Church (1972) found Qcr to range from 9.7 to 15.1 m^3s^{-1} for Ekalugad rivers. The Einstein equations over-predicted for the high discharge events (by a factor of 5) and under-predicted for the low discharge events (by a factor of 4). The total annual bedload transport (based on Bagnold's equations) was found to be an order-of-magnitude larger than the suspended load transport (Fig. 18.6).

(5) Neoglacial ice advance from side entry glaciers has in a number of cases caused extensive alteration to fjord sedimentation process. Alterations include the formation of sills (North Arm, Fig. 18-9A), and ice dammed lakes (North Arm, Fig. 18-9B; Stewart Lakes, Fig. 18-9CO that were once marine. Isostatic rebound has also allowed the emergence of sills (e.g. Tromso Fiord, Fig. 18-9D; Ekalugad Fiord) that in turn has lead to the formation of lakes at the fjord-head.

Figure 18-10 gives three 1960 EMR air photographs with site locations marked for subsequent photographs (Figs. 18.11 to 18.14).

Oliver Sound Glacier (Fig. 18.10A) has retreated substantially since 1960. The ice proximal sandur has a number of channels all at significantly different elevations. There appears to be a rapid drop in grain size away from the ice front. The sandur is covered in sheet sands and linguoid rippled crevasse splays. At the ice front, basal till (Fig. 18.11D) is presently being laid down (Fig. 18.11C) with englacial material. The local streams are composed of extremely poorly sorted sediment (Fig. 18.11B) that very much resembles a basal till. McBeth River delta (Fig. 18.10B) was noted to have well developed wave-built storm ridges flanking the main sandur delta (Fig 18.12C). Extensive boulder strewn tidal flats are seaward of these gravel ridges (Fig. 18.12D). Interdistributary mouth bar is composed of a surface covering of sandy wave ripples over a gravel lag (river sediment). Sandy sediment is brought back into the delta plain by the action of fall storm waves. Ice has protected certain parts of the delta surface from the action of waves. The result is flat sandy patches in weird shapes surrounded by rippled sediment. On the drier raised terraces, gravel has been moved by wind. The NE part of the delta front is covered in over-bank muds of which 60% has been destroyed by wind. This results in islands of clay anchoring down the coarser but more easily eroded sand. The river bank has a fining upward sequence (gravel to sand) of fluvial current ripples, truncated by a gravelly iron oxide layer, overlain by iron-rich aeolian sand, finally topped with a gravel lag. The aeolian dune (Fig. 18.13B) in behind the bedrock promintory is 400m long and 100m wide with very little differences in grain size (between 1.8 and 1.90). Sand collected in a thick snow layer was found to have similar grain size properties (samples 10 and 11 or 2038 and 2039). The alluvial fan (Fig 18.13C) appears to be both a source and temporary storage place for aeolian sand. The wind blown sand gets trapped in the numerous channels that cover the fan. With the advent of polygonal ice cracking the distal fan appears to be checkered with the polygons orthogonal to the stream channels (Fig. 18.13D). The source of the large aeolian dune (Fig. 18.13B) may originate from the fan. Although the raised marine muds are presently being eroded by wind (Fig. 18.13A) they predominantly contain mud (sample MC12, 2040: contains 98.5% mud). These raised marine terraces (Fig 18.12 A, B) contain folded and faulted sequences of layered mud. The gravel fragments on the present day surface may have originated from local ice rafting (Fig 18.13A).

There are two deltas at the head of Cambridge Fiord; both the Cambridge and Keel R. deltas (Fig. 18.10C) were investigated (Figs. 18.7, 18,18, 18.19). A marine limit of 50m above sea level was observed ($\simeq$ 6000 BP). The Cambridge sandur developed as an ice-proximal delta, whereas the Keel River delta, then, was submerged as a shallow-water tributary fjord. Since that time, the Cambridge delta has undergone a series of terrace incisions (Fig. 18.14C). Given below are some initial erosion calculations:

Terrace	H (m)	Al (km^2)	As (km^2)	V ($x10^6m^3$)	T (BP)	E ($kg\ a^{-1}$)
1	50	1.5	0.6	4.5	6000-5900	7.2×10^7
2	45	1.2	0.8	2.8	5900-5500	1.1×10^7
3	38	0.7	0.2	3.0	5500-5200	1.6×10^7
4	32	0.4	0.03	2.6	5200-4750	0.9×10^7
5	25	0.33	0.14	4.8	4750-0	0.2×10^7

where H is the height above mean sea level
Al was the active paleo-sandur surface
A2 is the remaining present-day terrace area
V is the volume of sediment removed
T is the time period of sediment removal
E is the annual rate of erosion assuming a particle density of 2650 kg m^{-3} and a soil porosity of 40%

In general as the rate of emergence has decreased so has the annual rate of erosion. The modern stream bed is armoured by a lag of course boulders.

An analysis of the distribution of storm ridges on the Cambridge delta (Fig. 18.19) reveal that for the last 1700 years B.P. the fjord must have been seasonally ice-free. Between 1700 and 3000 years B.P. no ridges were formed and it is thought to reflect a more permanent ice cover. Before 3000 years, the fjord may have been occasionally been ice free. The above analysis is based on the fact that summer winds are always strong enough to cause storm waves. The Keel River delta (Fig. 18.14D) consists predominantly of eroded raised marine terraces (Fig. 18.14A). These marine sediments consist of alternating silty sands and sandy muds occasionally with anoxic beds (Fig. 18.14E). The Keel River bed-sediment is in equilibrium with the stream power.

The Itirbilung Sandur has a number of ice-cored moraines (Little Ice Age) that contribute significant aeolian and fluvial sediment (Figs. 18.15, 18.16C). The raised sandur surface (pre Little Ice Age) contains extensive barchan dune fields and aeolian deflation surfaces with blow-out pits (Fig. 18.16D). The delta surface was covered with wave-generated lingoid bars (Figs. 18.16A, B) that indicates extensive landward movement of sediment during the fall 'hurricane' season. Figure 18.17D is an example of frozen fluvial current ripples that have been polished by the blasting of wind-blown sand.

We witnessed the period of freeze-up at the Keel and McBeth delta. At low tide, the brackish water ($23^0/_{00}$) froze to the top of the tidal flat sand. Specifically, the ice froze to the top of wave ripples, incorporating 3 to 4 grains (in thickness) of the ripple crest. As the tide began to rise, the ice was lifted up and floated out to sea. The photo of Figure 18.17C was taken some 400m seaward of the delta front.

A quick survey of the Clyde River delta revealed striking exposures of proximal glaciomarine mud unformable to a basal till unit (Fig. 18.17A). These units were stratigraphically adjacent to lateral moraine unit (Fig. 18.17A). The Clyde River delta was found unusual for the nature of its present destructive delta front processes. Wave and tidal action appear to have operative over a period of low river discharge. We speculate that during the infilling of Generator Lake, associated with the retreat of a recent surge of the Barnes ice Cap (Holdsworth, 1973) the Clyde River had such a period of low seasonal discharges. The Clyde River delta is an excellent place to observe the extensive nature of hydrofracturing of gravel particles (Fig. 18.17B).

6) Size frequency distributions were obtained from most of the samples. The gravel fraction was separated from the finer fraction using a standard 2mm sieve. Where appropriate the gravel fraction was sieved using ¼φ sieves (standard ASTM). The sand fraction was separated from the mud using a 53 um wet sieve. The sand fraction was analyzed for its equivalent spherical sedimentation diameter at $^1/_5$φ interval using the computerized A.G.C. settling tube. The mud fraction where appropriate was analyzed on a computerized sedigraph^R 5000D for the particles equivalent spherical sedimentations diameters at $^1/_5$φ interval over the range of 0.5 um to 63 um. The methods' results were merged using program MERGE and analyzed on program READY.

Figure 18.20 is the master location map for sediment samples and site investigations. Details of sample locations can be found in figures 18.21, 22, 24, 25 for McBeth, Cambridge, Cape Hewett and Bylot barriers, respectively. Details on Stewart Lake Samples can be found in Gilbert et. al., 1985.

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Table 18.1

Fjord-Inugsuin

Section	t (Km^2)	g (km^2)	ELA (m)	SFL (m)	Q_t m^{3}x10^6	Q_r m^{3}x10^6	Q_N m^{3}x10^6	Q_I m^{3}x10^6	S (m)	W (m)
In_1	471.1	.8	650	1425	85.3	22.1	63.0	0.2	.047	.134
In_2	225.1	35.4	605	1425	41.2	10.8	25.6	4.8	.048	.135
In_3	479.0	207.0	775	1425	88.1	23.5	36.7	27.9	.049	.135
In_4	229.3	8.7	850	1425	42.2	11.2	29.8	1.2	.049	.135
In_5	379.9	189.5	800	1425	69.9	18.6	25.7	25.6	.049	.135
In_6	373.2	89.5	700	1425	69.8	17.9	39.4	12.5	.048	.138
Fjord-Tingin										
T_1	301.5	109.0	625	1500	54.3	10.6	27.9	15.8	.035	.145
T_2	140.2	28.5	650	1500	26.2	5.6	16.4	4.2	.04	.147
T_3	179.0	38.1	725	1500	33.5	7.2	20.7	5.6	.04	.147
T_4	34.9	5.0	775	1500	6.5	1.4	4.4	0.7	.04	.147
T_5	142.5	49.9	750	1500	26.5	5.7	13.5	7.3	.04	.146
T_6	91.7	29.9	700	1500	17.1	3.7	9.0	4.4	.04	.146
T_7	370.2	118.5	700	1500	66.6	13.0	36.5	17.1	.035	.145
Fjord-Maktak										
M_1	128.9	10.9	950	1575	31.6	4.9	24.4	2.3	.038	.207
M_2	930.1	463.7	1000	1575	227.9	35.3	96.6	96.1	.038	.207
M_3	149.6	5.5	940	1575	36.7	5.7	29.8	1.2	.038	.207

Table 18.1 (Continued)

Fjord-McBeth

Section	t (Km^2)	g (Km^2)	ELA (m)	SFL (m)	Q_t $m^3 x 10^6$	Q_r $m^3 x 10^6$	Q_N $m^3 x 10^6$	Q_I $m^3 x 10^6$	S (m)	W (m)
Mc_1	1708.2	25.8	925	1475	324.6	85.4	235.5	3.7	.05	.140
Mc_2	284.3	99.0	800	1475	55.4	14.2	26.9	14.3	.05	.145
Mc_3	297.2	149.4	775	1475	56.5	13.4	21.4	21.7	.045	.145
Mc_4	322.8	66.2	725	1475	61.3	14.5	37.2	9.6	.045	.145
Mc_5	343.0	.8	625	1475	65.2	13.7	51.3	0.2	.04	.15
Mc_6	278.1	158.4	825	1475	48.7	8.3	17.4	23.0	.03	.145
Mc_7	284.5	163.5	790	1475	55.5	14.2	17.6	23.7	.05	.145
Mc_8	132.8	54.5	725	1475	25.2	5.3	11.8	8.1	.04	.15
Mc_9	419.9	31.3	675	1475	75.6	12.6	58.3	4.7	.03	.15

Fjord-Itirbilung

It_1	128.2	30.4	700	1500	25.0	5.8	14.7	4.5	.045	.15
It_2	1344.8	376.2	850	1500	260.9	61.9	143.4	55.6	.046	.148
It_3	378.9	228.7	780	1500	73.5	17.4	22.2	33.9	.046	.15
It_4	275.3	74.7	725	1500	54.0	12.7	30.1	11.2	.046	.15
It_5	288.9	13.8	650	1500	55.8	13.0	40.7	2.1	.045	.148

Fjord-Cambridge

C_1	100.7	32	620	1450	19.6	7.1	8.6	3.9	.07	.125
C_2	69.5	34	650	1450	13.9	4.9	4.6	4.4	.07	.13
C_3	79.9	28	660	1450	16.4	6.0	6.8	3.6	.075	.13
C_4	91.3	.8	690	1450	18.7	6.9	11.8	0	.075	.13
C_5	180.6	1.7	715	1450	37.9	14.5	23.3	0.1	.08	.13
C_6	146.3	.9	740	1450	30.7	11.7	18.9	0.1	.08	.13
C_7	623.7	8	755	1450	131	49.9	80.0	1.1	.08	.13
C_8	125.6	3	720	1450	25.8	9.4	15.9	0.5	.075	.13
C_9	139.1	16	700	1450	28.5	10.4	16.0	2.1	.075	.13
C_{10}	60.2	8	685	1450	12.0	4.2	6.8	1.0	.07	.13
C_{11}	221.0	5	695	1450	44.2	15.5	28.1	0.6	.07	.13
C_{12}	205.5	23	670	1450	40.1	14.4	22.8	2.9	.07	.125

Table 18.1 (Continued)

Section	t (Km^2)	g (Km^2)	ELA (m)	SFL (m)	Q_t m^{3}x10^6	Q_r m^{3}x10^6	Q_N m^{3}x10^6	Q_I m^{3}x10^6	S (m)	W (m)
Fjord-North Pang										
NP_1	306.6	30.2	950	1585	76.7	12.9	57.5	6.3	.042	.208
NP_2	1447.1	364.0	1050	1585	361.9	60.8	225.4	75.7	.042	.208
NP_3	244.2	38.2	950	1585	61.1	10.3	42.9	7.9	.042	.208
Fjord-Pangnirtung										
P_1	650.6	90.8	850	1650	157.5	52.1	90.7	14.7	.08	.162
P_2	130.3	4.0	850	1650	31.5	10.4	20.5	0.6	.08	.162
P_3	577.5	218.4	950	1650	139.8	46.2	58.2	35.4	.08	.162
P_4	135.7	40.4	870	1650	32.8	10.9	15.4	6.5	.08	.162
P_5	123.0	3.3	820	1650	29.8	9.8	19.4	0.6	.08	.162
P_6	65.0	0	780	1650	15.7	5.2	10.5	0	.08	.162
Fjord-Sunneshine										
S_1	92.6	2.1	550	1650	59.8	9.8	48.9	1.1	.106	.540
S_2	178.1	52.6	650	1650	115.1	18.9	67.8	28.4	.106	.540
S_3	100.4	18.2	675	1650	64.9	10.6	44.4	9.9	.106	.540
S_4	154.8	19.4	575	1650	100.0	16.4	73.1	10.5	.106	.540
Fjord-Coronation										
Co_1	113.4	9.4	950	1580	28.0	4.5	21.5	2.0	.040	.207
Co_2	1011.4	493.3	1050	1580	249.8	40.5	107.3	102.1	.040	.207
Co_3	80.9	6.2	950	1580	20.0	3.2	15.5	1.3	.040	.207
Fjord-Clark										
CL_1	228.9	96.7	850	1450	38.0	10.5	15.9	11.6	.046	.120
CL_2	150.9	34.3	875	1450	25.0	6.9	14.0	4.1	.046	.120
CL_3	350.4	179.1	900	1450	58.2	16.1	20.6	21.5	.046	.120
CL_4	300.3	55.9	775	1450	50.8	13.2	30.6	7.0	.044	.125
CL_5	459.2	132.5	700	1450	77.6	20.2	40.8	16.6	.044	.125

Table 18.2: Mean Annual Suspended Load

Basin	Qst kg $a^{-1}(x10^6)$	basin	Qst kg $a^{-1}(x10^6)$	basin	Qst kg $a^{-1}(x10^6)$
IN_1	1.0	T_1	2.2	M_1	0.1
IN_2	0.2	T_2	0.1	M_2	42.9
IN_3	4.0	T_3	0.2	M_3	0.2
IN_4	0.2	T_4	0.0		
IN_5	2.3	T_5	0.2	NP_1	0.8
IN_6	0.7	T_6	0.0	NP_2	21.5
		T_7	0.6	NP_3	0.5
P_1	3.5				
P_2	0.1	IT_1	0.1	CO_1	0.1
P_3	12.7	IT_2	9.4	CO_2	170.5
P_4	0.2	IT_3	8.4	CO_3	0.1
P_5	0.1	IT_4	0.4		
P_6	0.0	IT_5	0.4	C_1	0.1
				C_2	0.0
CL_1	0.4	Mc_1	15.0	C_3	0.1
CL_2	0.1	Mc_2	1.1	C_4	0.1
CL_3	1.4	Mc_3	1.3	C_5	0.2
CL_4	0.4	Mc_4	0.5	C_6	0.1
CL_5	0.8	Mc_5	0.6	C_7	2.4
		Mc_6	0.9	C_8	0.1
S_1	0.5	Mc_7	1.8	C_9	0.1
S_2	1.9	Mc_8	0.2	C_{10}	0.0
S_3	0.6	Mc_9	0.8	C_{11}	0.3
S_4	1.4			C_{12}	0.2

TABLE 18.3 Predicted annual input of suspended load (Qst) for eleven (SAFE) Baffin Island fjords

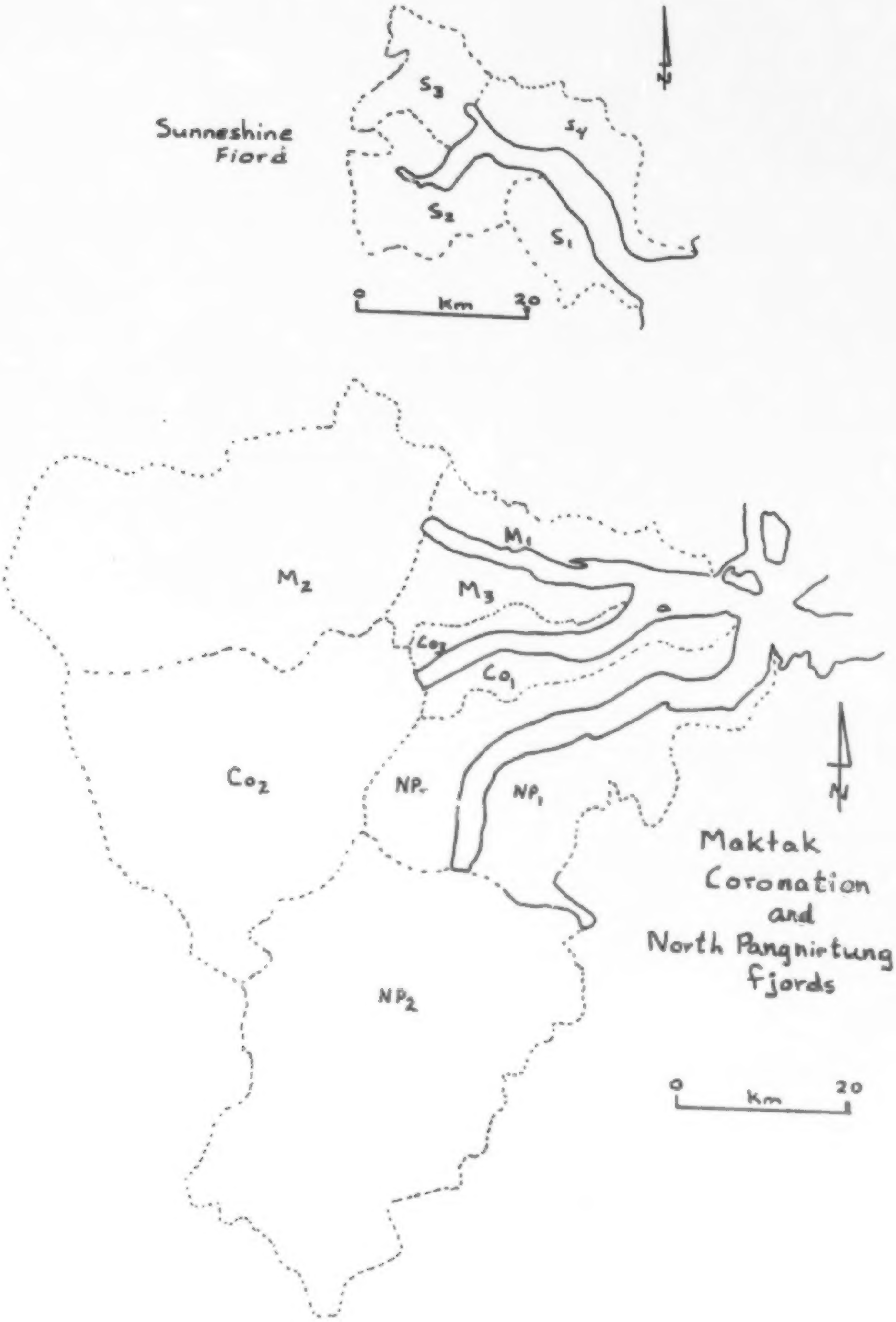
	fjordhead basin(s), Qst (kg a^{-1})		fjord total, Qst (kg a^{-1})	
Group 1	T2 + T3	0.3×10^6	Tingin	3.3×10^6
	CL_2	0.1×10^6	Clark	3.1×10^6
	C_7(Keel R.)	2.4×10^6	Cambridge	3.7×10^6
	S_3(Shannagh R.)	0.6×10^6	Sunneshine	4.4×10^6
	In_4	0.2×10^6	Inugsuin	8.4×10^6
Group 2	P_3 (Weasel R.)	12.7×10^6	Pangnirtung	16.6×10^6
	It_2(Itirbilung R.)	9.4×10^6	Itirbilung	18.7×10^6
	Mc_1(McBeth R.)	15.0×10^6	McBeth	22.2×10^6
	Np_2(Owl R.)	21.5×10^6	North Pangnirtung	22.8×10^6
Group 3	M_2 (Maktak R.)	42.9×10^6	Maktak	43.2×10^6
Group 4	Co_2(Coronation G.)	170.5×10^6	Coronation	170.7×10^6

Table 18.4

SAMPLES		SIZE FRACTIONS (%)					MOMENT STATISTICS (ø)			
Sample	ID	Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
Ol. S.-1	1356	0.03	92.93	7.03	6.95	0.08	2.40	1.03	1.31	6.57
Ol. S.-2	1357	35.50	62.80	1.70	0.85	0.85	-0.28	2.43	0.13	3.67
Ol. S.-3	1358	0.09	29.20	70.71	66.12	4.58	4.90	1.51	1.43	7.26
Ol. S.-4	1359	-	19.70	80.30	76.51	3.78	5.36	1.62	-0.46	3.06
Guys B.	1360	2.00	97.80	0.20	0.10	0.10	1.13	0.90	-0.89	16.72
Guys B.	1361	0.30	99.70	-	-	-	1.54	0.43	-3.02	43.04
Guys B.	1362	-	99.70	0.30	0.30	-	1.47	0.43	1.89	14.36
Egl. S.	1363	0.10	99.90	-	-	-	1.29	0.53	-0.83	7.13
Scott I.	1364	-	100.00	-	-	-	1.73	0.37	-0.16	6.01
S. Bar.-1	1365	-	100.00	-	-	-	1.96	0.25	-0.34	4.76
S. Bar.-2	1366	-	100.00	-	-	-	2.04	0.23	-0.90	4.63
S. Bar.-5	1367	-	100.00	-	-	-	1.83	0.30	-0.20	4.12
S. Bar.-6	1368	-	100.00	-	-	-	1.80	0.30	1.38	11.32
S. Bar.	1369	0.90	99.10	-	-	-	1.99	0.54	-7.24	68.35
M. Bar.	1370	-	100.00	-	-	-	1.76	0.36	-0.13	4.53
M. Bar.	1371	-	100.00	-	-	-	1.93	0.29	0.31	8.48
M. Bar.	1372	-	99.72	0.28	0.28	-	1.84	0.36	0.82	9.03
M. Bar.	1373	-	99.20	0.80	0.40	0.40	1.82	0.67	6.12	58.64
M. Bar.	1374	-	100.00	-	-	-	1.42	0.42	-0.13	3.20
M. Bar.	1375	-	5.40	94.60	87.20	7.40	5.78	1.52	1.29	6.08
C.Adair	1376	0.40	99.60	-	-	-	0.18	0.41	0.49	32.93
C.Hew.-1	1377	1.80	86.85	11.35	7.34	4.01	2.82	2.21	1.97	10.50
C. Hew.1	1378	0.90	98.10	1.00	0.50	0.50	1.24	0.98	2.41	26.37
C. Hew.2	1379	-	100.00	-	-	-	1.75	0.26	0.05	6.21
C. Hew.2	1380	-	100.00	-	-	-	1.79	0.30	1.27	10.70
C. Hew.2	1381	-	100.00	-	-	-	1.92	0.30	2.29	15.56
C.Hew.-2	1382	12.70	86.70	0.60	0.30	0.30	0.13	1.22	0.41	13.97
C.Hew.-2	1383	0.10	98.90	1.00	0.50	0.50	1.83	0.77	5.04	44.61
C.Hew.-2	1384	-	100.00	-	-	-	1.83	0.34	1.79	12.38
C.Hew.-3	1385	-	99.97	0.03	0.02	0.02	1.88	0.31	2.21	52.56
C.Hew.-3	1386	-	99.80	0.20	0.10	0.10	1.51	0.53	3.92	47.21
C.Hew.-4	1387	-	99.50	0.50	0.25	0.25	1.81	0.61	5.16	53.39
McBeth-1	1388	0.03	93.71	6.26	3.13	3.13	2.33	1.67	2.29	8.47
Clyde	1389	1.60	98.40	-	-	-	1.01	0.72	-2.72	17.25
Fechan	1390	-	100.00	-	-	-	1.45	0.36	-0.51	5.27
Camb.	1391	1.60	98.40	-	-	-	1.57	0.79	-2.91	19.09
Camb.	1392	-	45.37	54.63	49.29	5.34	4.56	1.80	1.42	6.31
St.Lakes	1393	-	78.02	21.98	21.98	-	3.52	0.85	1.16	4.53
St.Lakes	1394	0.30	99.60	0.10	0.05	0.05	0.89	0.59	1.64	30.74
St.Lakes	1395	-	100.00	-	-	-	1.82	0.44	0.20	4.96
St.Lakes	1396	-	42.38	57.62	38.02	19.60	5.41	2.11	0.35	1.24
Kogalu-1	1397	0.02	99.98	-	-	-	0.47	0.27	-0.80	8.90
Kogalu-2	1398	0.10	99.90	-	-	-	0.61	0.41	-0.06	14.17
Kogalu-3	1399	-	100.00	-	-	-	1.03	0.41	0.80	10.80
Kogalu-4	1400	1.80	98.20	-	-	-	0.97	0.73	-2.74	17.43
Kogalu-5	1401	0.10	99.90	-	-	-	0.91	0.35	-0.66	23.79
Kogalu-6	1402	-	47.66	52.34	49.40	2.94	3.99	2.46	0.10	1.81

Table 18.4 (Continued)

Sample ID		SIZE FRACTIONS (%)					MOMENT STATISTICS (0)			
		Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
Itir.	1403	-	97.40	2.60	1.30	1.30	2.15	1.15	3.33	17.93
Coutts	1404	2.70	96.10	1.20	0.60	0.60	1.57	1.13	0.38	19.99
Pond	1405	-	100.00	-	-	-	1.65	0.38	-0.47	3.78
C.Hew.	1406	-	97.82	2.18	1.09	1.09	1.65	1.09	4.12	25.04
CA-D #7	2042	8.01	72.43	19.56	18.38	1.18	1.96	2.42	0.18	3.34
#8	2043	0.60	98.50	0.90	0.45	0.45	1.18	1.01	2.47	21.22
#10	2044	40.57	58.23	1.20	0.60	0.60	-0.51	1.90	0.83	6.15
#17	2045	2.14	49.50	48.36	35.44	12.92	3.89	3.45	0.27	1.92
#22	2046	1.96	90.76	7.28	7.00	0.28	1.59	1.51	0.82	6.22
#26	2047	0.20	97.13	2.67	1.42	1.25	2.15	1.24	2.34	13.63
#27	2048	59.62	39.68	0.70	0.35	0.35	-1.44	2.06	0.85	4.33
#28	2049	1.99	97.61	0.40	0.20	0.20	0.64	1.01	1.40	15.05
#31	2050	0.32	79.99	19.69	17.86	1.83	2.35	1.97	1.41	4.57
#32	2051	0.00	95.41	4.59	3.09	1.50	2.99	0.99	3.89	20.15
#33	2052	1.70	94.54	3.76	1.96	1.80	1.11	1.70	2.31	10.70
#34	2053	0.10	30.51	69.39	53.79	15.61	5.47	2.30	0.37	3.07
#35	2054	0.00	90.10	9.90	8.50	1.40	2.96	1.20	3.14	17.36
	73	0.39	96.06	3.55	2.40	1.15	2.17	1.26	1.95	11.67
MC #1	2155	0.10	22.58	77.32	65.03	12.29	5.53	2.11	-0.11	3.11
#2	2156	0.40	97.78	1.82	1.02	0.80	1.48	1.08	3.34	23.15
#3	2157	0.36	98.82	0.82	0.47	0.35	0.78	0.95	3.24	25.64
Pit#3	2158	-	49.67	50.33	44.98	5.34	4.25	1.99	1.00	4.86
Pit#3	2159	0.20	99.05	0.75	0.50	0.25	1.37	0.78	3.10	30.23
Pit#3	2035	3.79	95.01	1.20	0.60	0.60	0.82	1.31	1.23	13.75
Pit#3	2036	-	90.54	9.46	7.97	1.49	3.06	1.21	3.37	21.21
#7	2037	79.01	19.16	1.83	0.93	0.90	-2.15	2.21	2.17	9.10
#9	2038	-	99.00	1.00	0.50	0.50	1.82	0.91	3.28	22.69
#11	2039	-	99.39	0.61	0.46	0.15	1.92	0.70	2.39	19.09
#12	2040	-	1.44	98.56	50.13	48.43	8.02	1.93	0.06	2.70
#15	2041	31.69	56.92	11.40	8.58	2.82	0.92	3.18	0.39	3.20
CA #1-1	2265	2.60	97.40	-	-	-	1.04	0.93	-1.72	10.60
#2-1	2266	0.70	99.11	0.19	0.19	-	1.57	0.80	-1.19	9.77
#3-1	2267	6.40	93.60	-	-	-	0.76	1.16	-1.90	7.59
#4-1	2268	0.30	99.70	-	-	-	1.22	0.58	-0.65	12.25
#5-1	2269	1.20	98.80	-	-	-	1.00	0.78	-1.32	10.12
#6-1	2270	1.10	98.90	-	-	-	0.88	0.68	-1.70	13.48
#7-1	2271	5.66	94.02	0.33	0.33	-	1.26	1.28	-1.92	7.41
b.c.-2	2272	26.64	73.12	0.24	0.24	-	0.04	2.05	-0.83	2.47
b.c.-2	2273	1.94	28.06	-	-	-	1.48	0.98	-1.16	8.23
b.c.-2	2274	18.59	79.34	2.07	1.17	0.90	0.89	2.20	-0.23	3.97
b.c.-2	2275	8.99	91.01	-	-	-	-0.02	1.09	-1.33	6.10
b.c.-2	2276	0.30	99.42	0.28	0.28	-	1.40	0.58	0.35	15.60
b.c.-2	2277	0.50	99.50	-	-	-	1.38	0.63	-1.28	15.96
b.c.-2	2278	8.52	89.50	1.97	1.17	0.80	1.25	1.72	-0.13	7.16
b.c.-2	2279	13.19	86.67	0.14	0.14	-	0.74	1.63	-1.30	4.01
b.c.-2	2280	38.90	60.98	0.12	0.12	-	-0.53	2.22	-0.41	1.70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Fiord
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S2
S1
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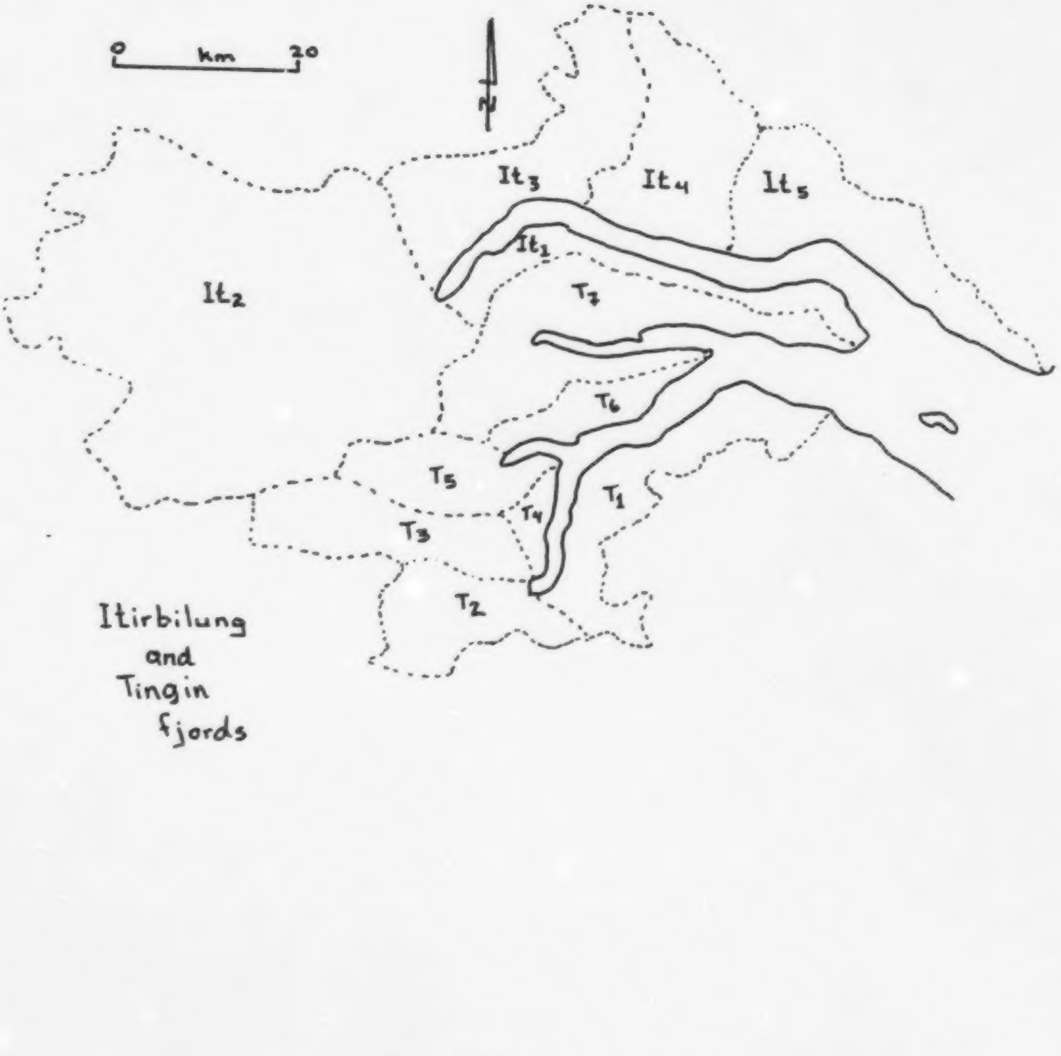
M1
M2
M3
Co3
Co1
Co2
NP
NP1
N
Maktak
Coronation
and
North Pangnirtung
fjords
NP2
0 km 20

Figure 18.1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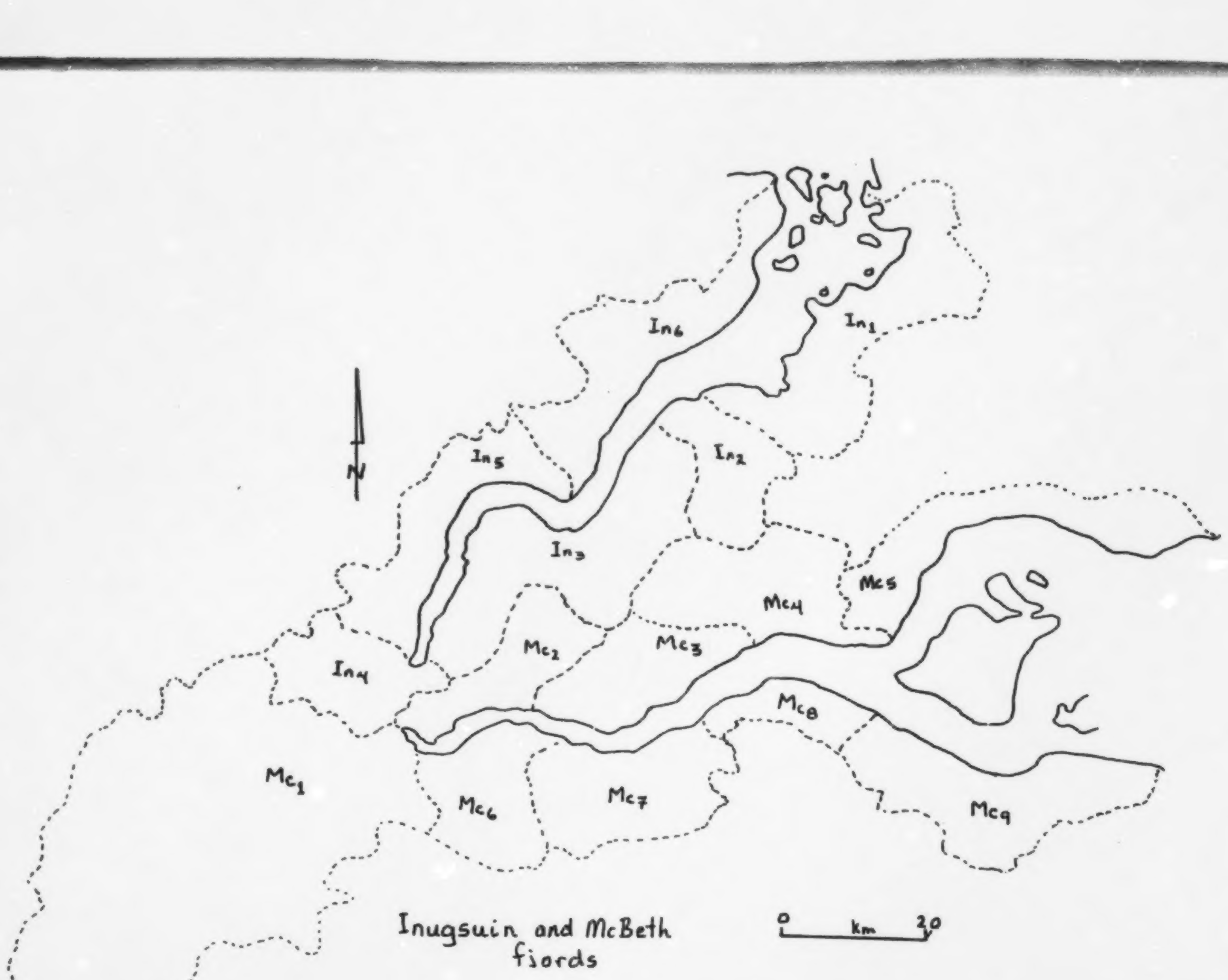
Itirbilung and Tingin fjords

Figure 18.1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In2
In5
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Mc5
Mc4
Mc3
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In4
Mc8
Mc1
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Mc7
Mc9
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Inugsuin and McBeth fiords
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km
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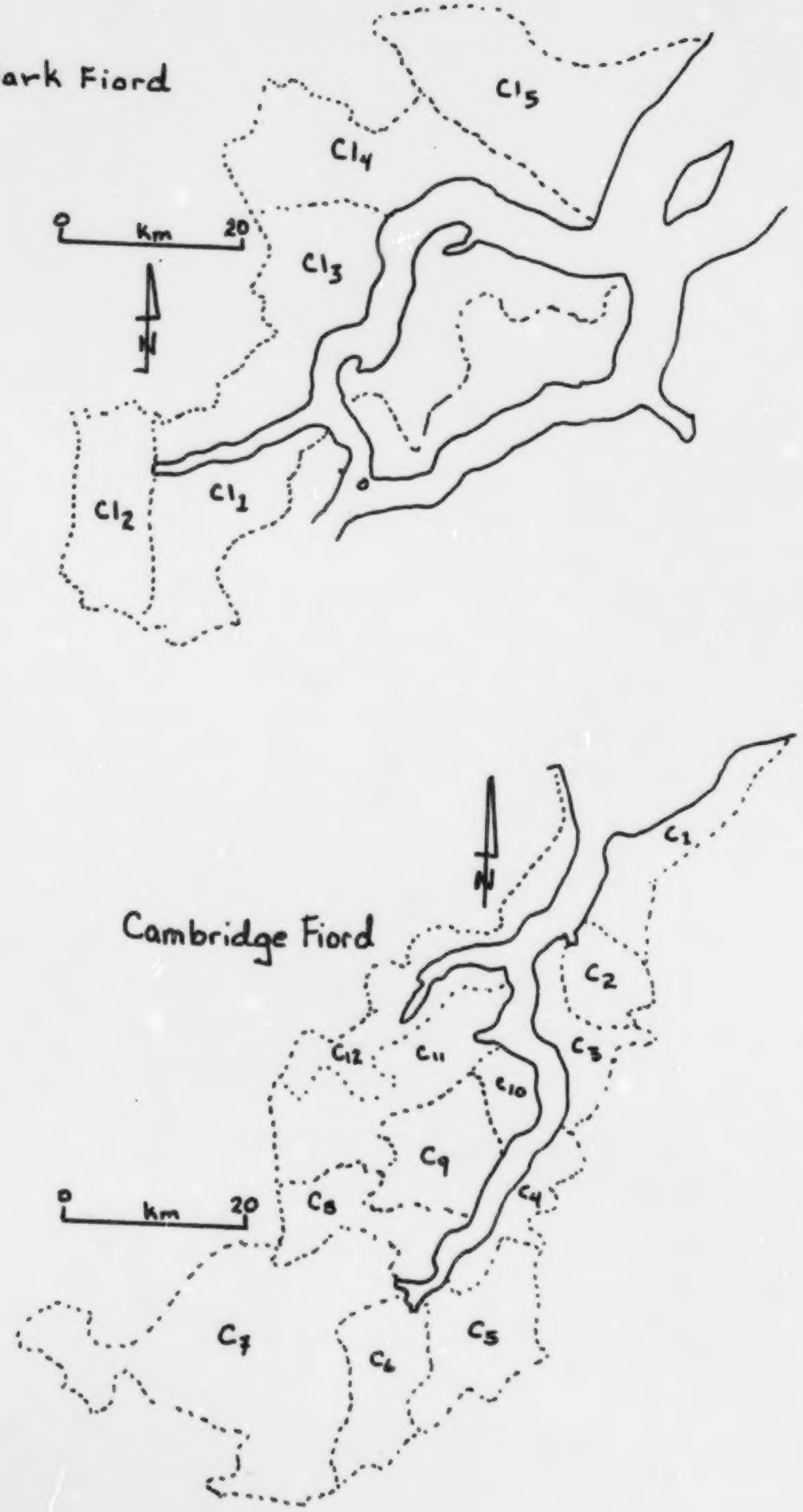
Figure 18.1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Cl2
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km
20
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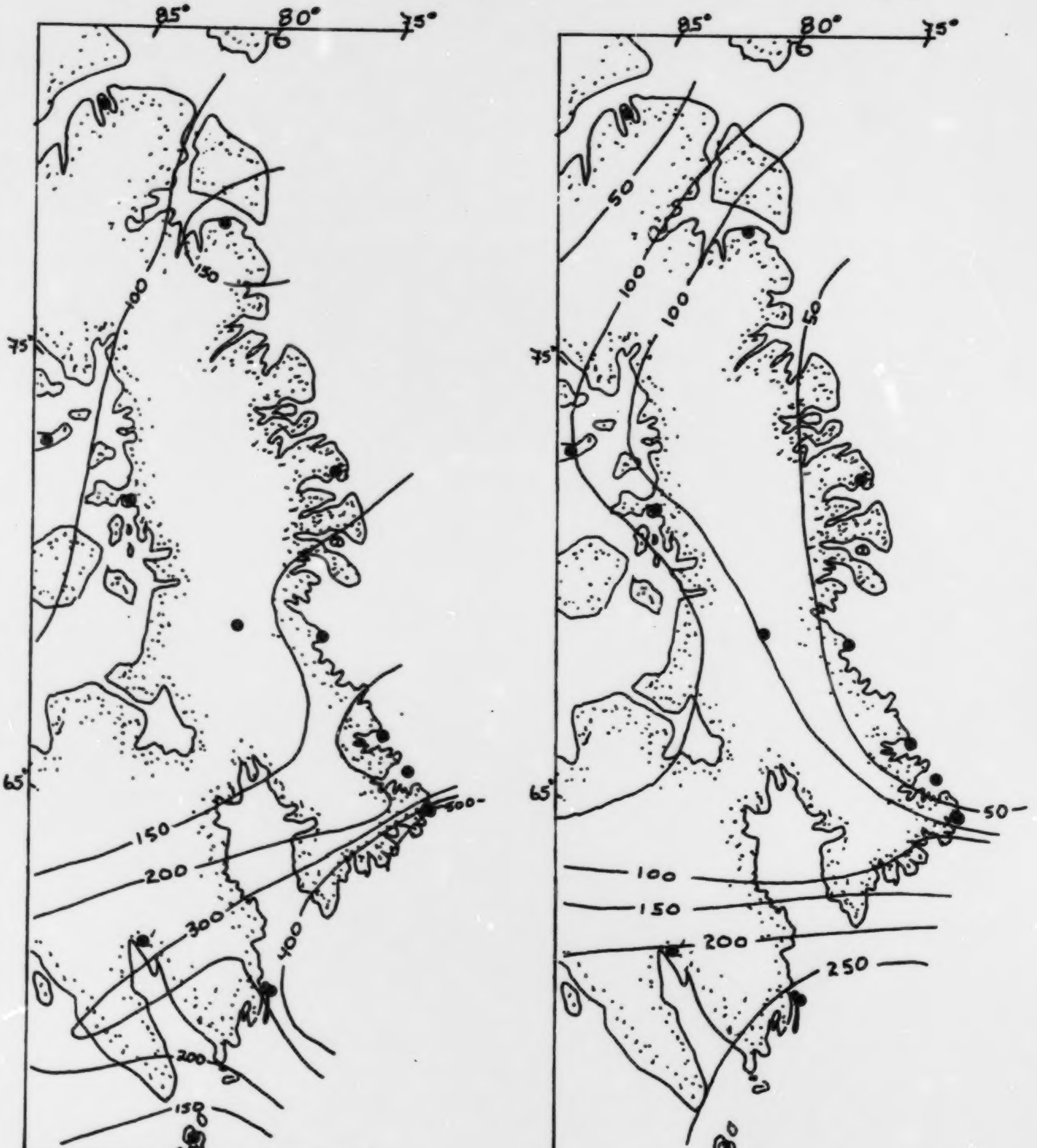
Cambridge Fiord
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
0
km
20
N

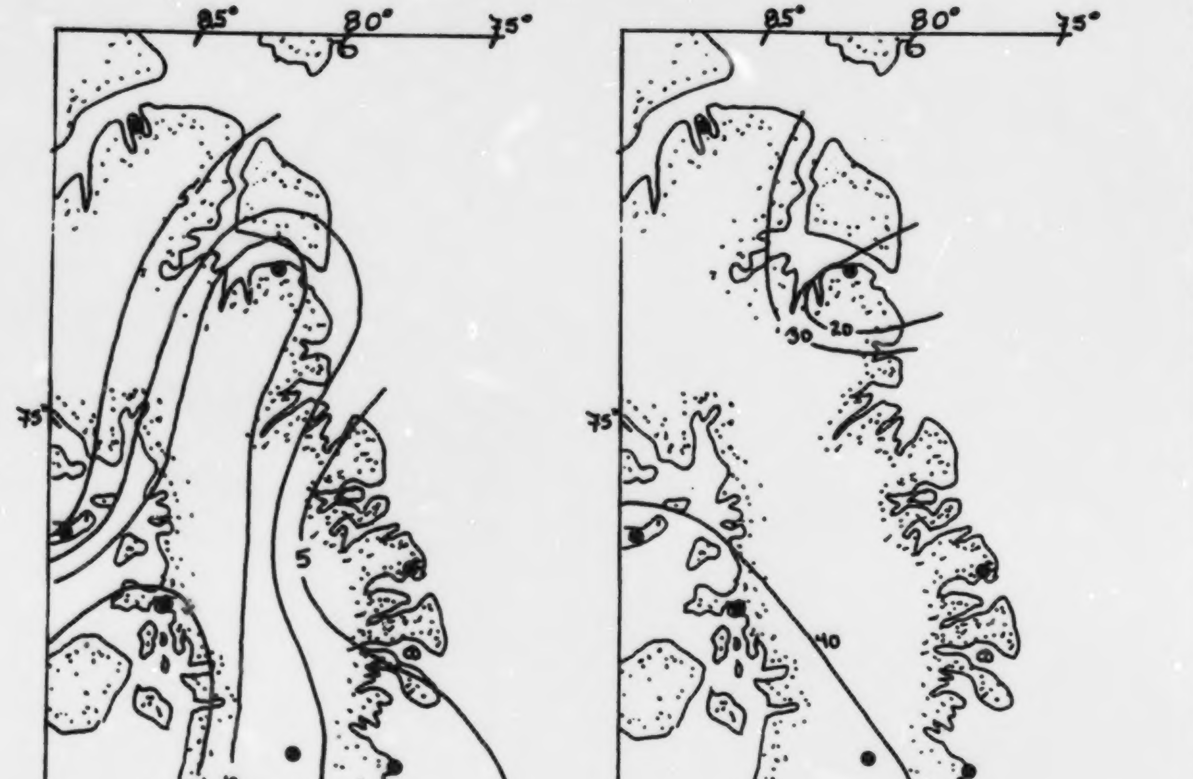
Figure 18.1



Nival Accumulation (mm of water)

Rainfall (mm)

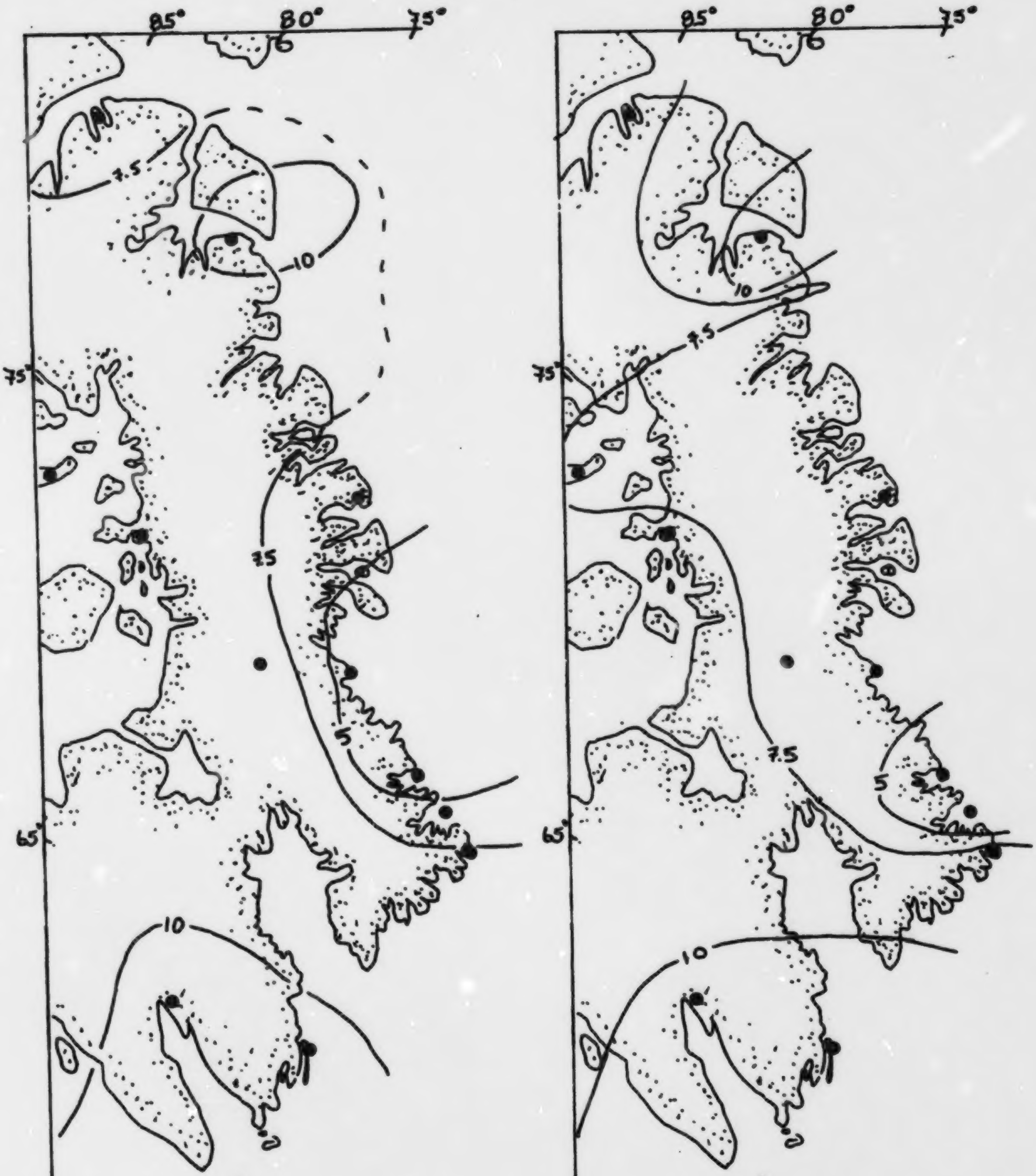
Figure 18.2



Degree days above 10°C (1951-1980)

Greatest rainfall in 24 hours (mm)

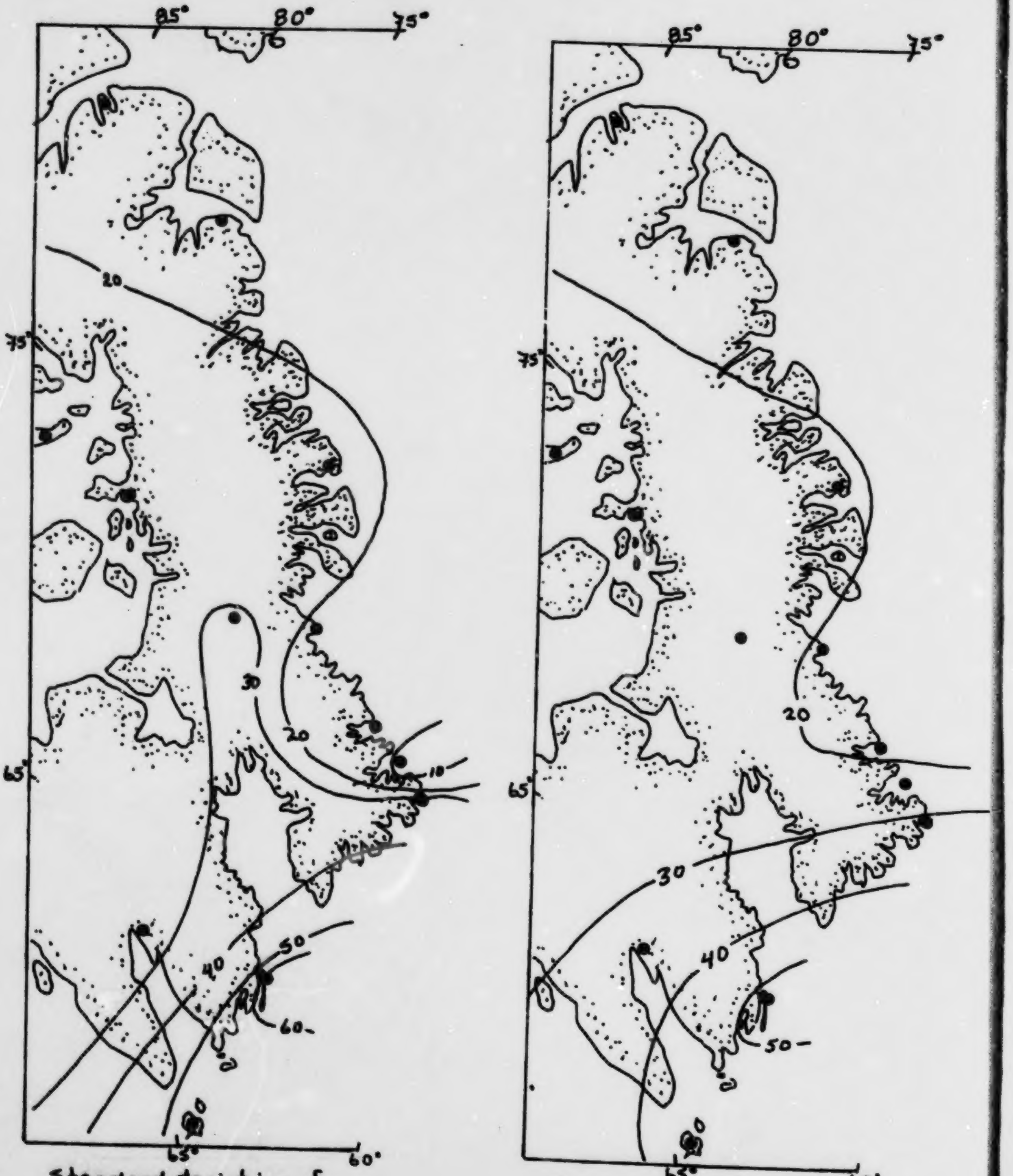
Figure 18.3



Number of days of measurable rainfall (July)

Number of days of measureable rainfall (Aug.)

Figure 18.4



Standard deviation of precipitation August (mm)

Standard deviation of precipitation July (mm)

Figure 18.5

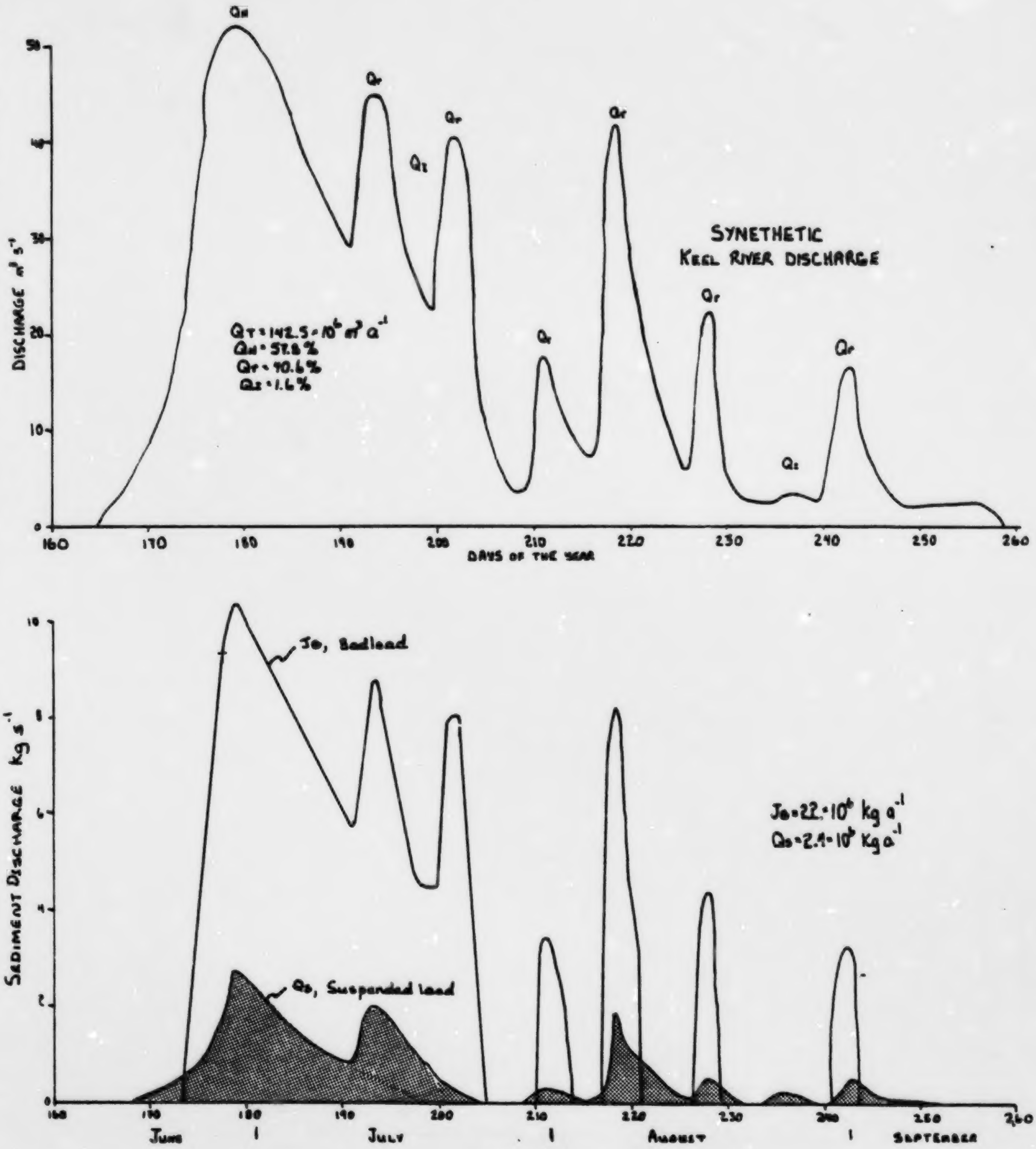

SYNETHETIC
KEEL RIVER DISCHARGE
Qn
Qr
Qr
Qr
Qr
Qr
Qr
Qs
Qs
QT = 142.5 · 10^6 m^3 a^-1
Qn = 57.8 %
Qr = 40.6 %
Qs = 1.6 %
DISCHARGE m^3 s^-1
0
10
20
30
40
50
160
170
180
190
200
210
220
230
240
250
260
DAYS OF THE YEAR
Jb, Bedload
Qb, Suspended load
Jb = 22 · 10^6 kg a^-1
Qb = 2.4 · 10^6 Kg a^-1
SEDIMENT DISCHARGE kg s^-1
0
2
4
6
8
10
June
1
July
1
August
1
September

Figure 18.6

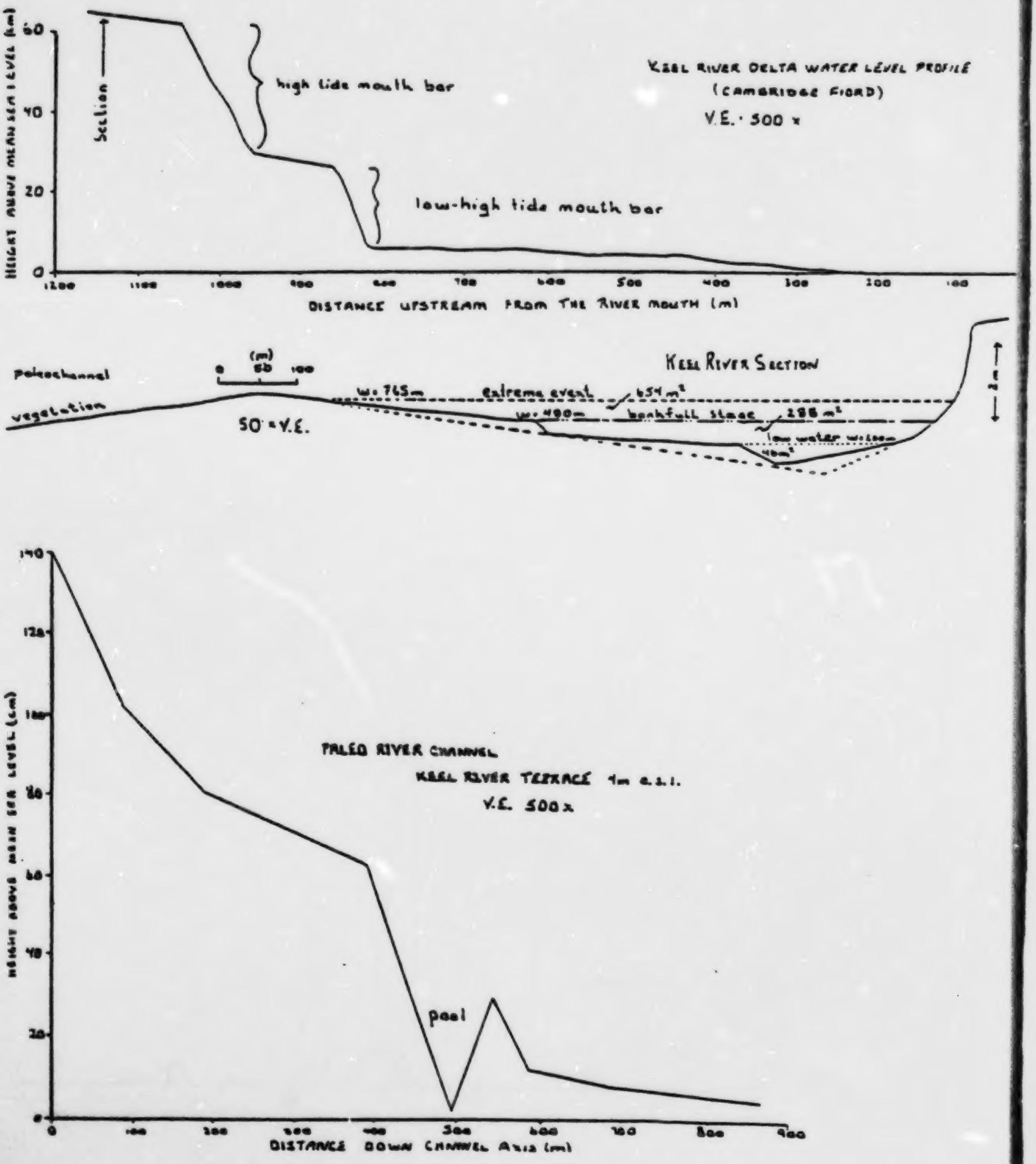

KEEL RIVER DELTA WATER LEVEL PROFILE
(CAMBRIDGE FIORD)
V.E. · 500 x
HEIGHT ABOVE MEAN SEA LEVEL (cm)
Section
high tide mouth bar
low-high tide mouth bar
0
20
40
60
1200
1100
1000
900
800
700
600
500
400
300
200
100
DISTANCE UPSTREAM FROM THE RIVER MOUTH (m)
KEEL RIVER SECTION
Paleochannel
vegetation
(m)
0
50
100
50 = V.E.
w = 765m
extreme event
654 m²
w = 490m
bankfull stage
286 m²
low water w = 300m
40m²
2 m
PALEO RIVER CHANNEL
KEEL RIVER TERRACE 4m a.s.l.
V.E. 500 x
HEIGHT ABOVE MEAN SEA LEVEL (cm)
pool
0
20
40
60
80
100
120
140
0
100
200
300
400
500
600
700
800
900
DISTANCE DOWN CHANNEL AXIS (m)

Figure 18.7

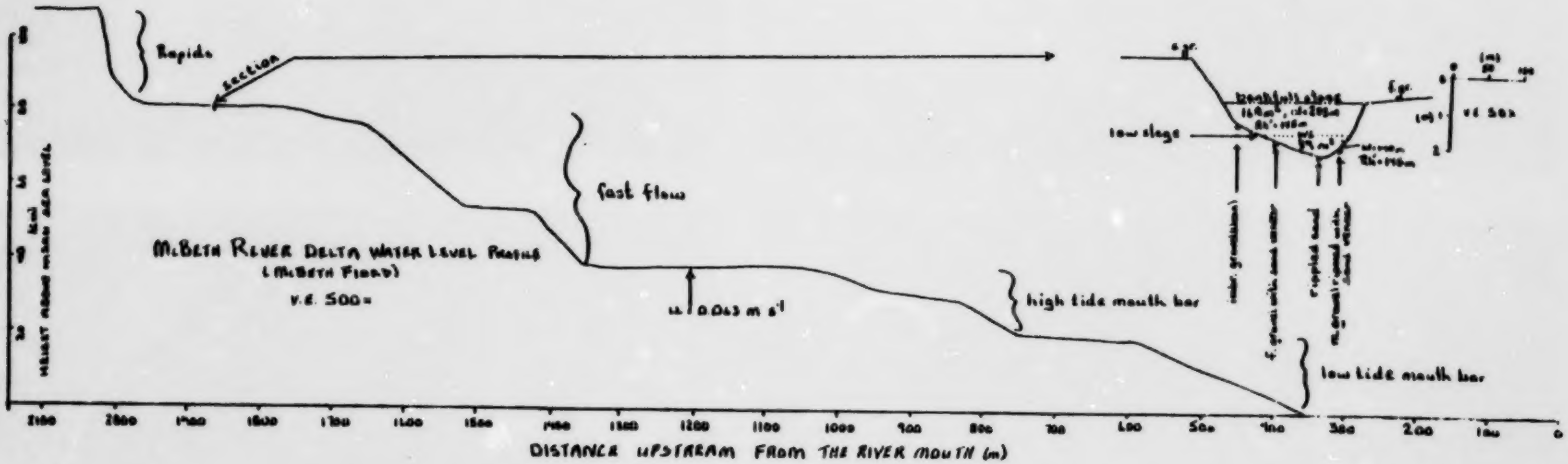

McBeth River Delta Water Level Profile
(McBeth Fiord)
V.E. 500×
Rapids
section
fast flow
u 0.063 m s⁻¹
high tide mouth bar
low tide mouth bar
low stage
bankfull stage
rippled sand
(m)
V.E. 50×
Height above mean sea level (m)
Distance upstream from the river mouth (m)
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0

Figure 18.8

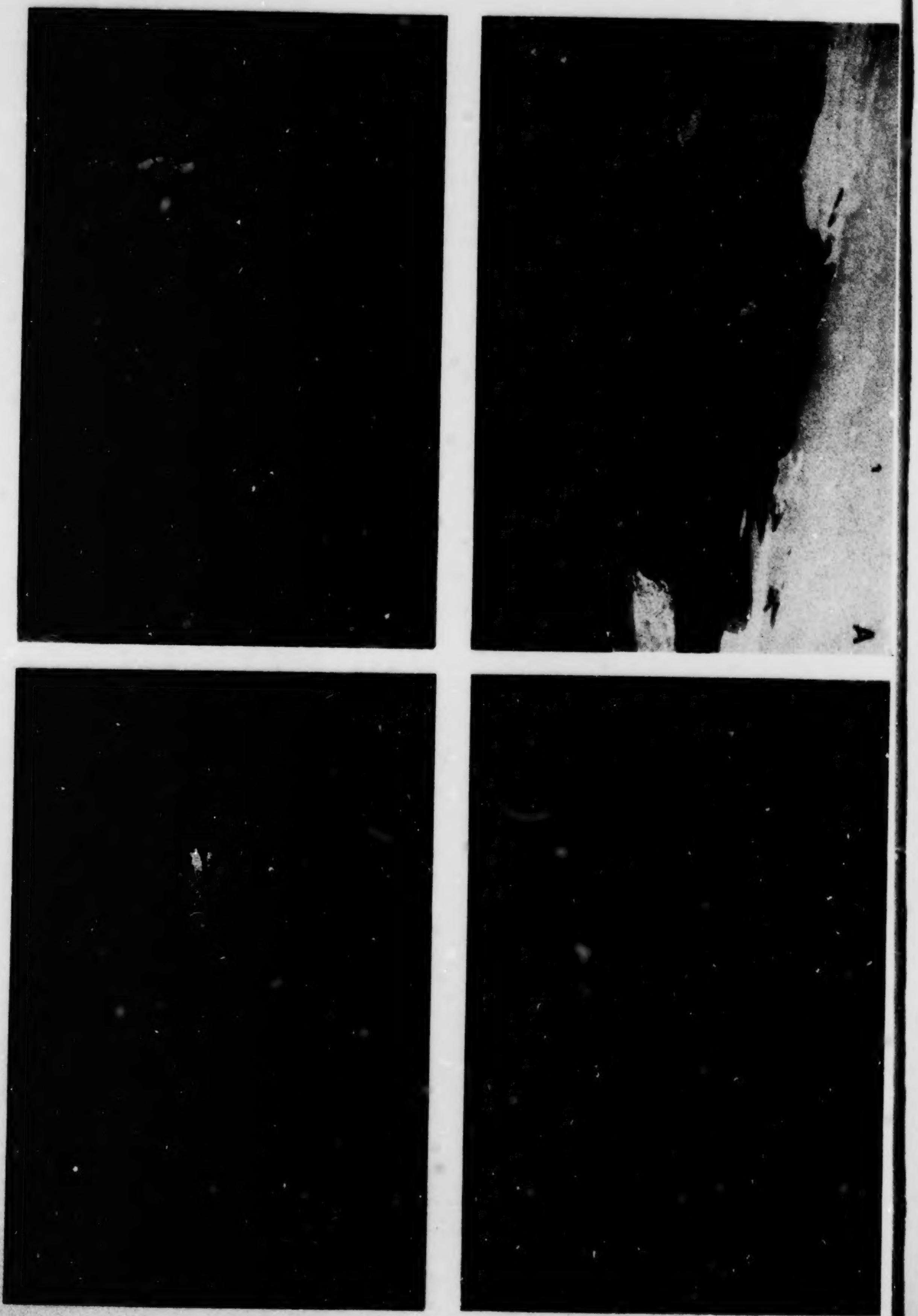


Figure 18.9

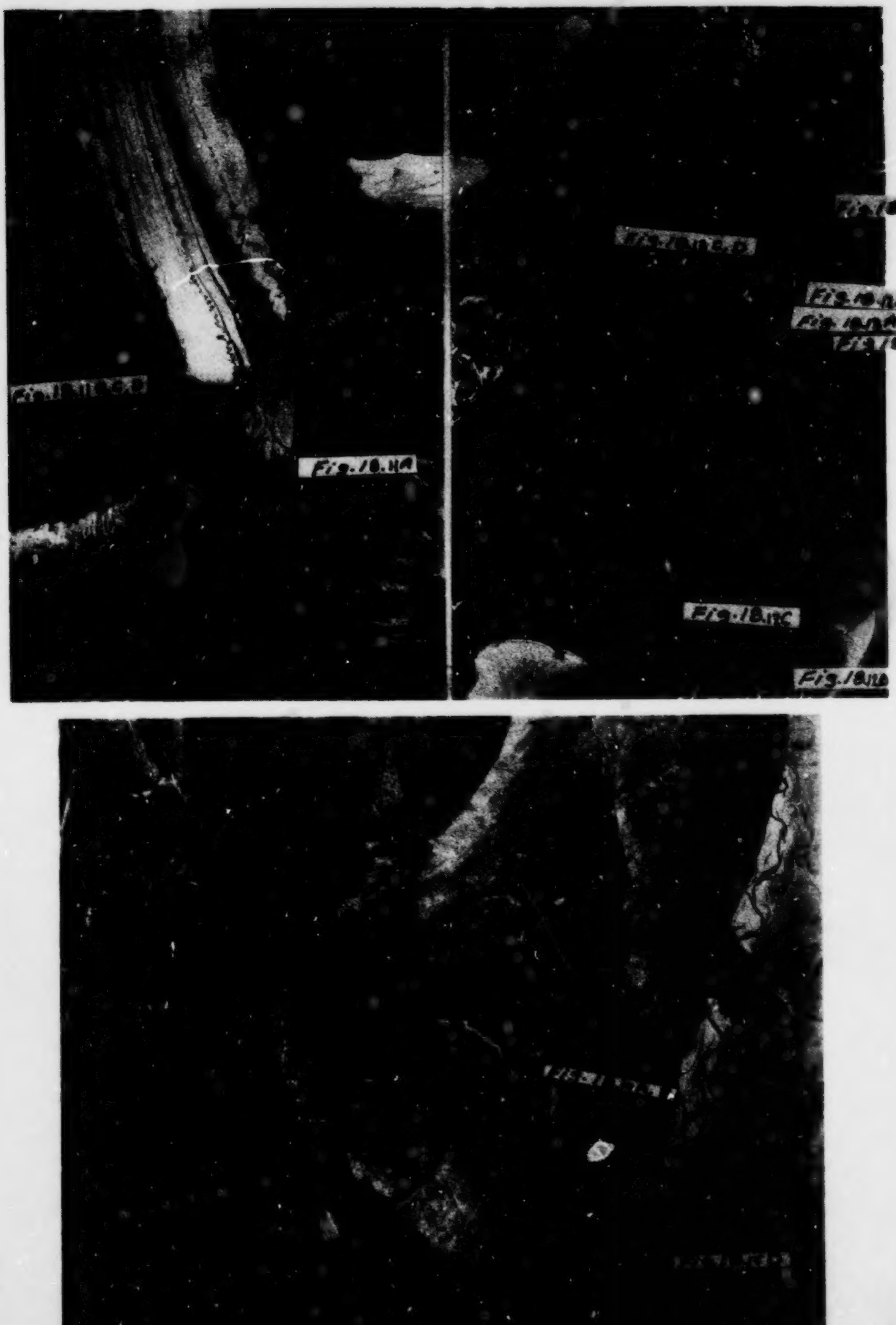


Fig. 18.11A
Fig. 18.12A
Fig. 18.11B
Fig. 18.11A
Fig. 18.13B
Fig. 18.11C
Fig. 18.12D

Figure 18.10

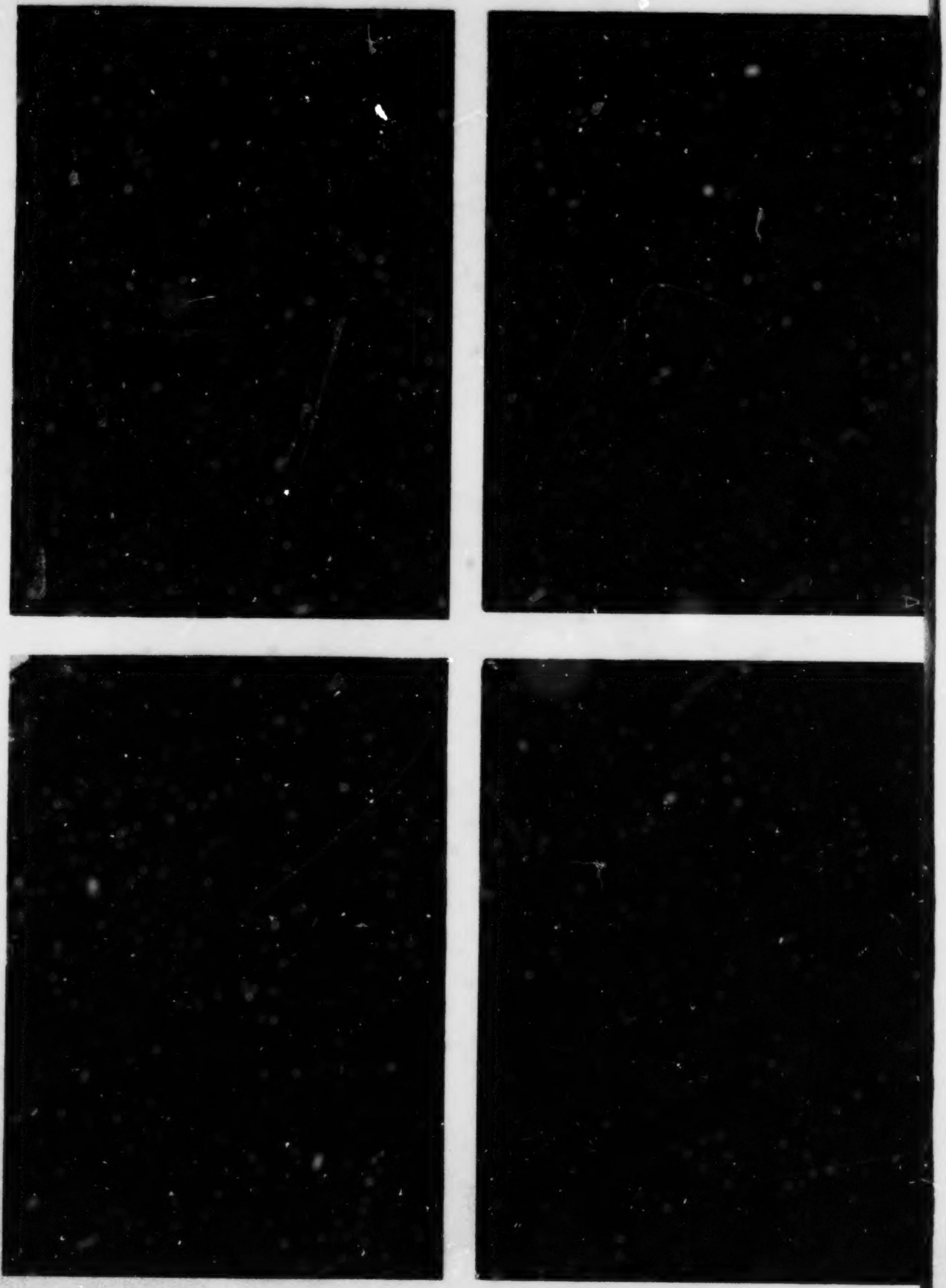


Figure 18.11

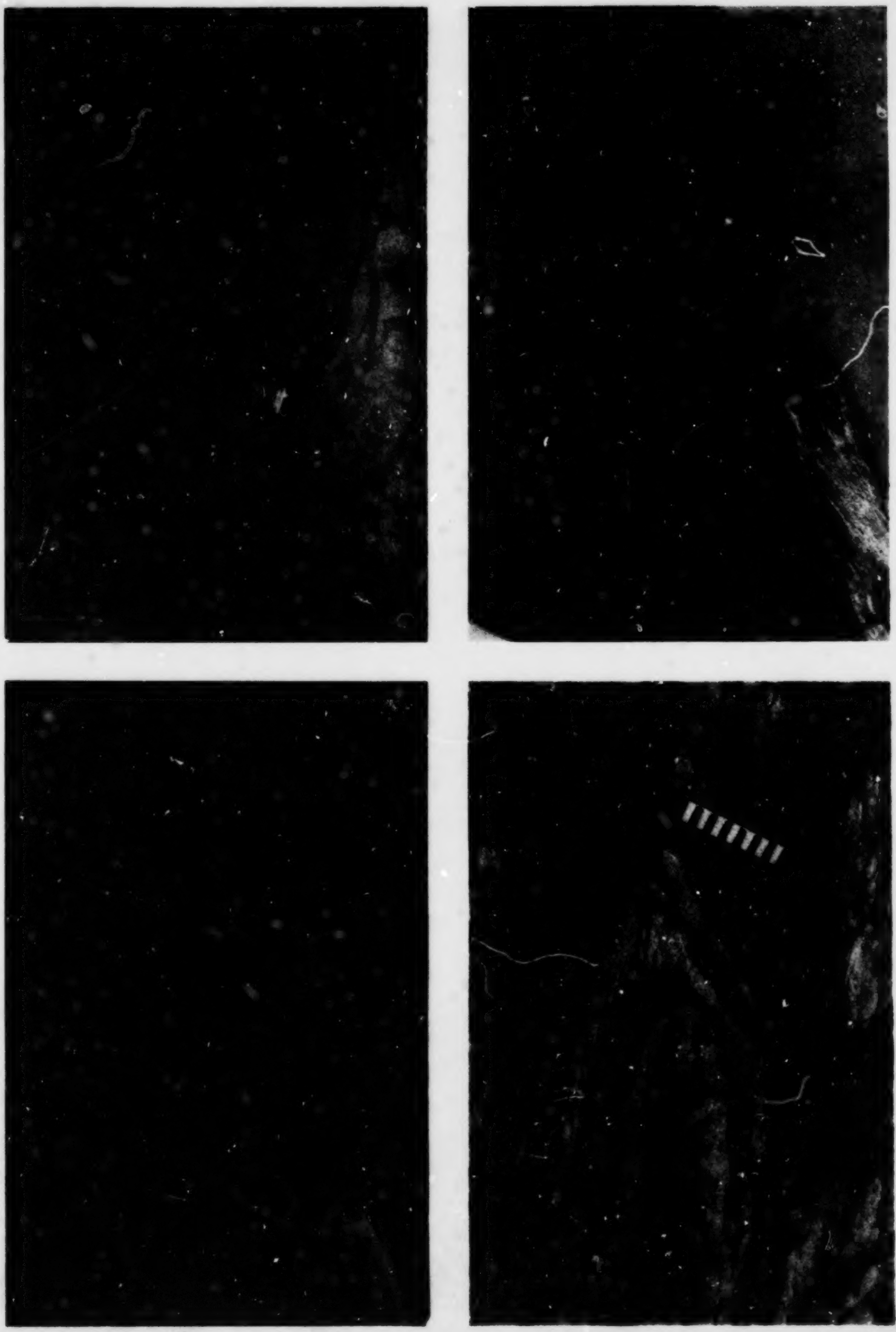


Figure 18.12

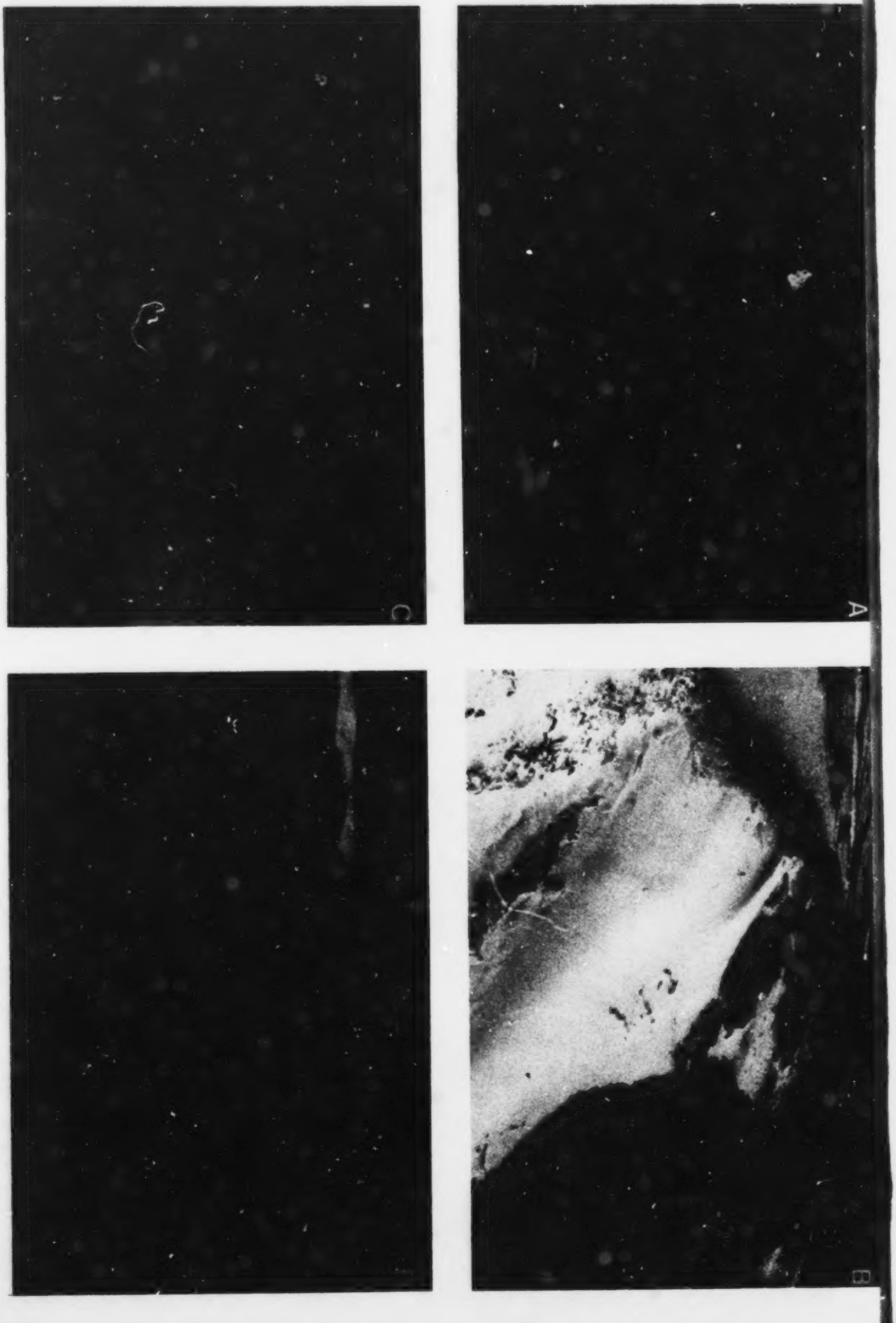


Figure 18.13

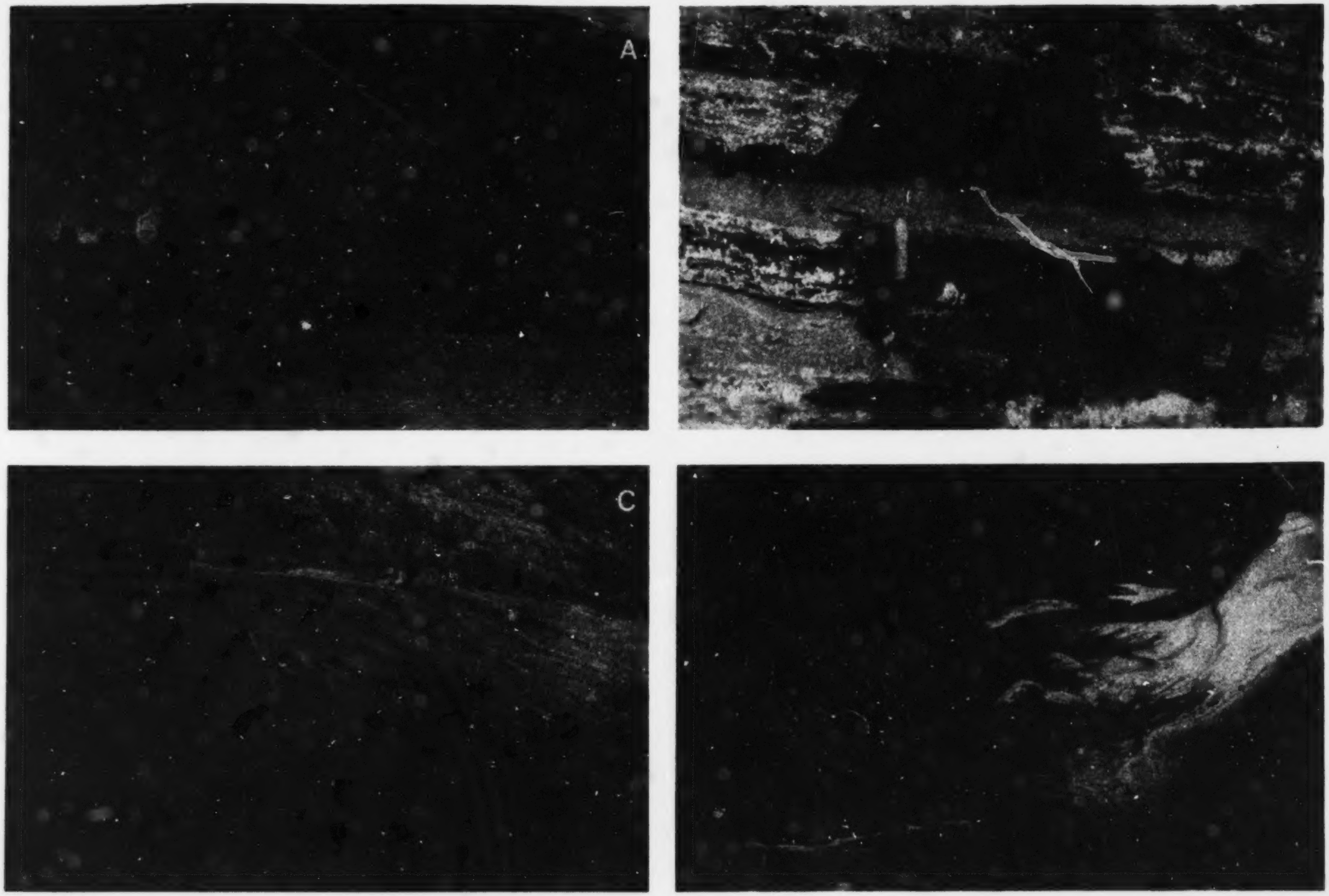


Figure 18.14

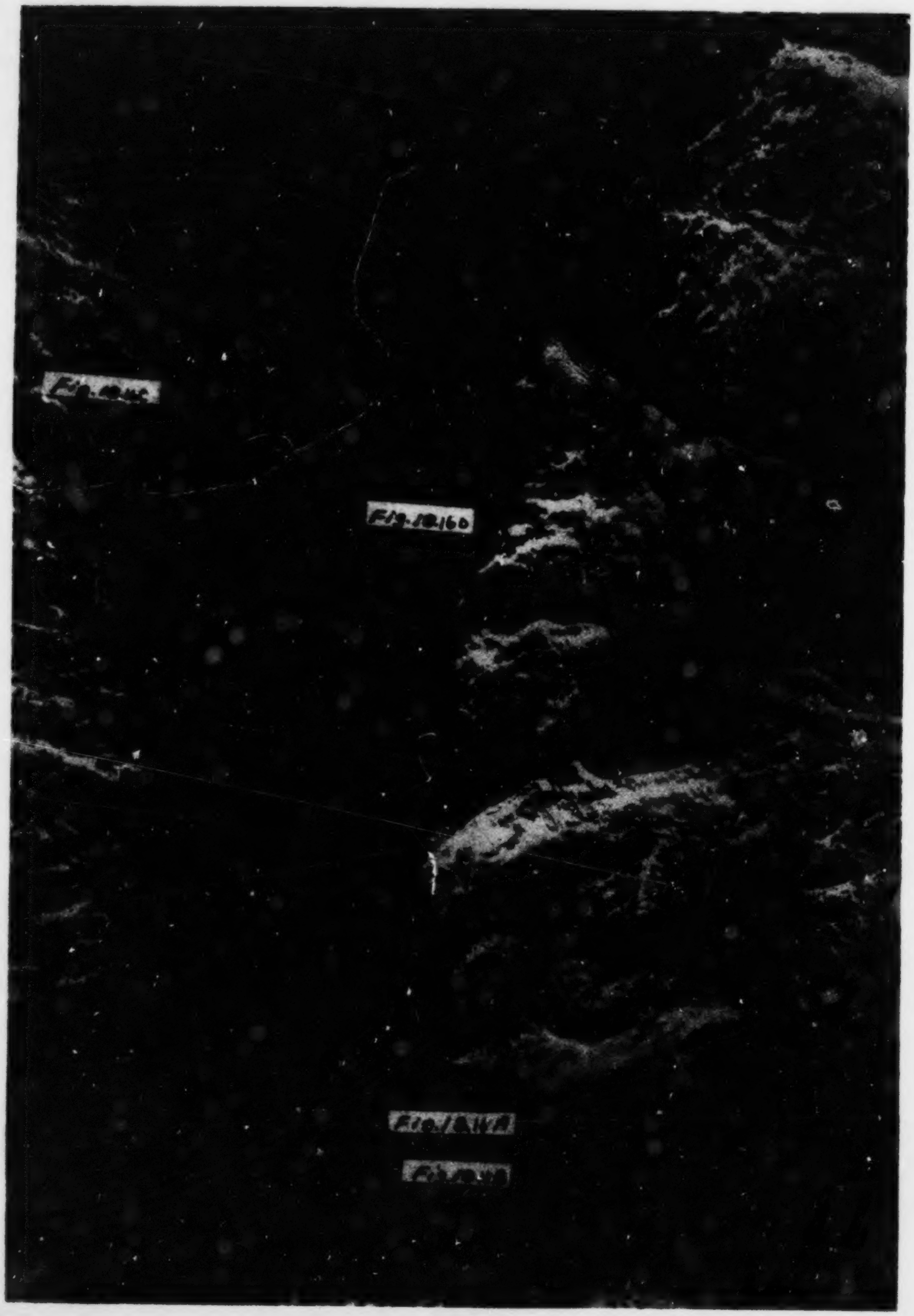


Figure 18.15

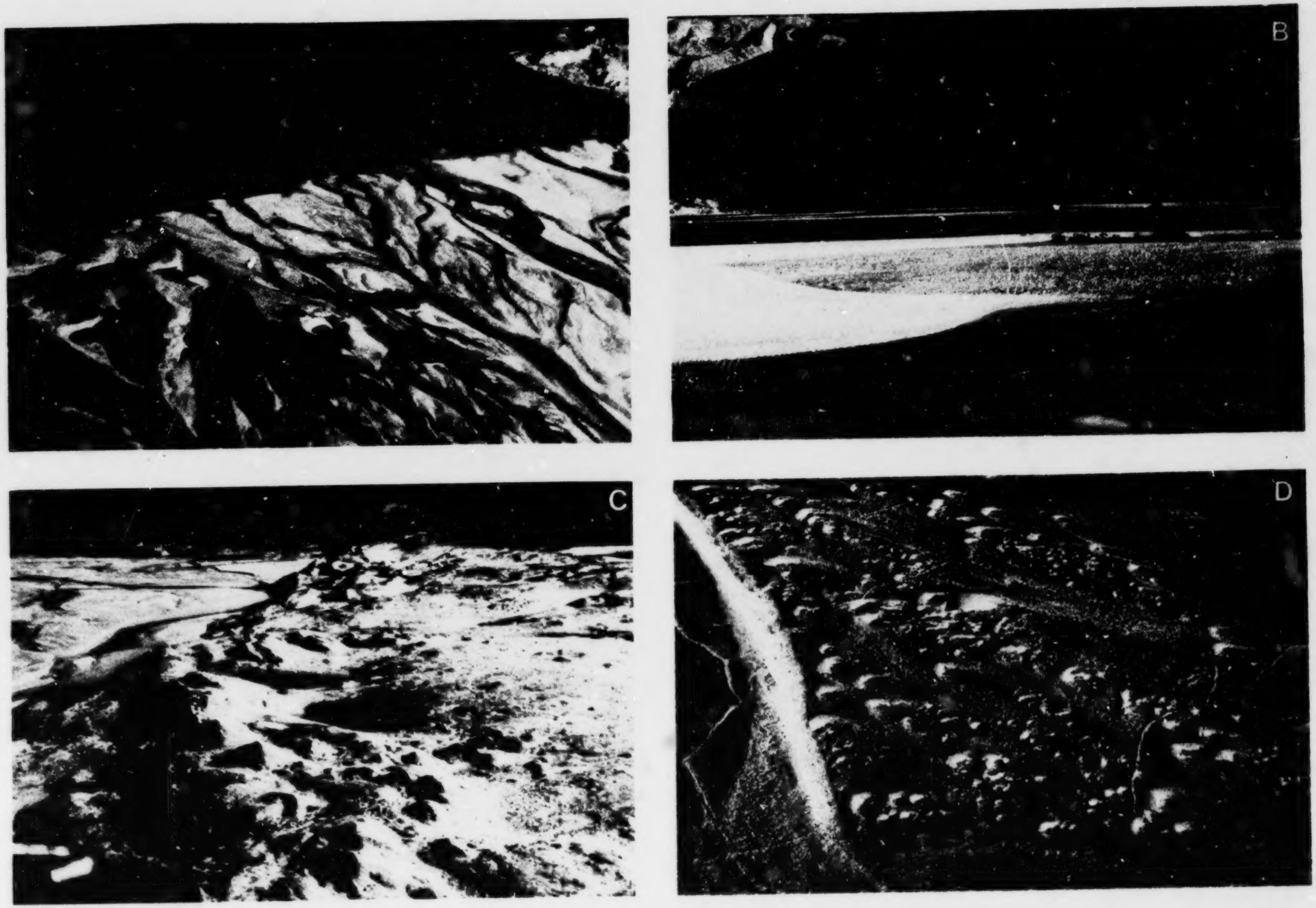


Figure 18.16

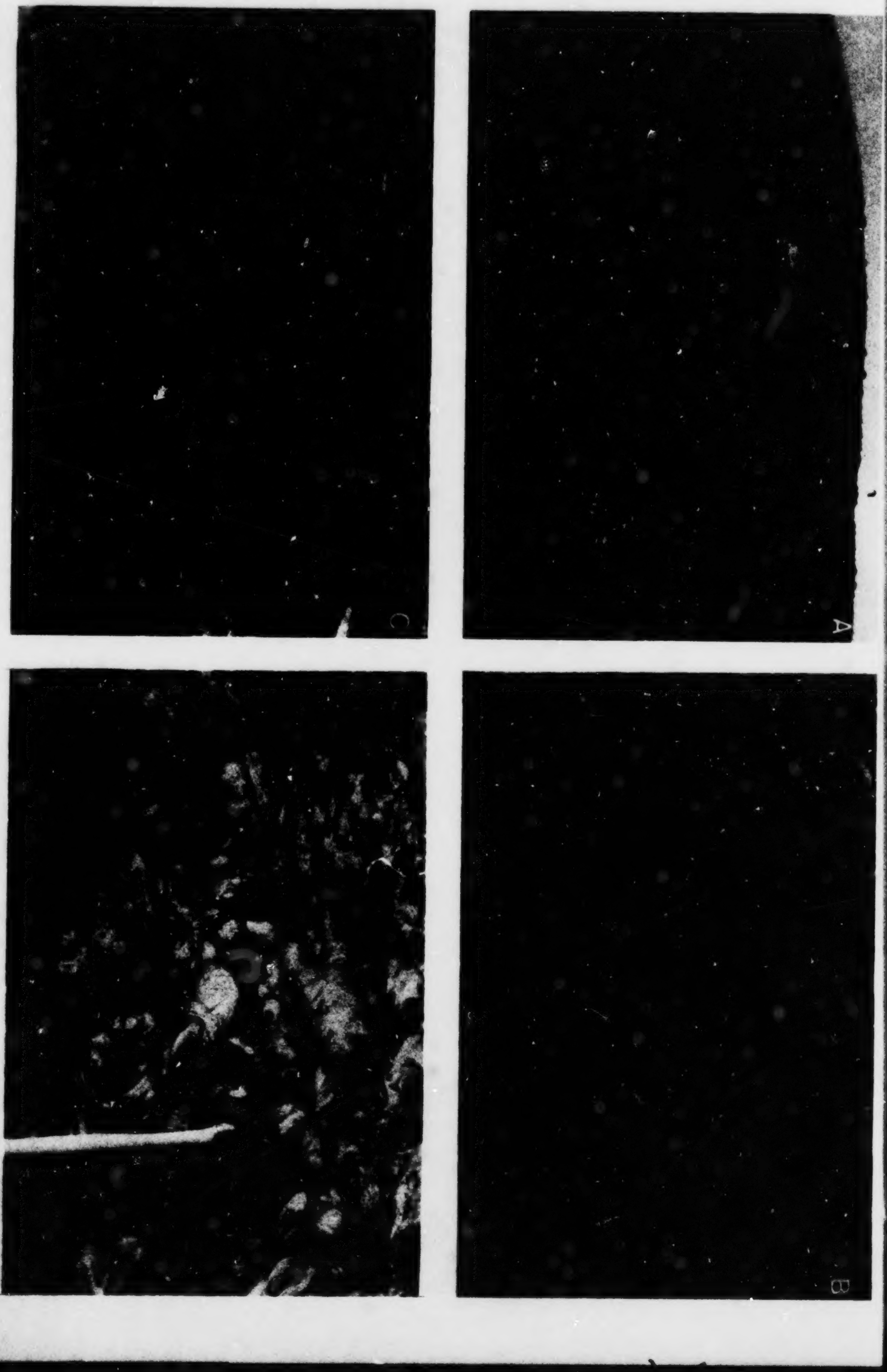


Figure 18.17

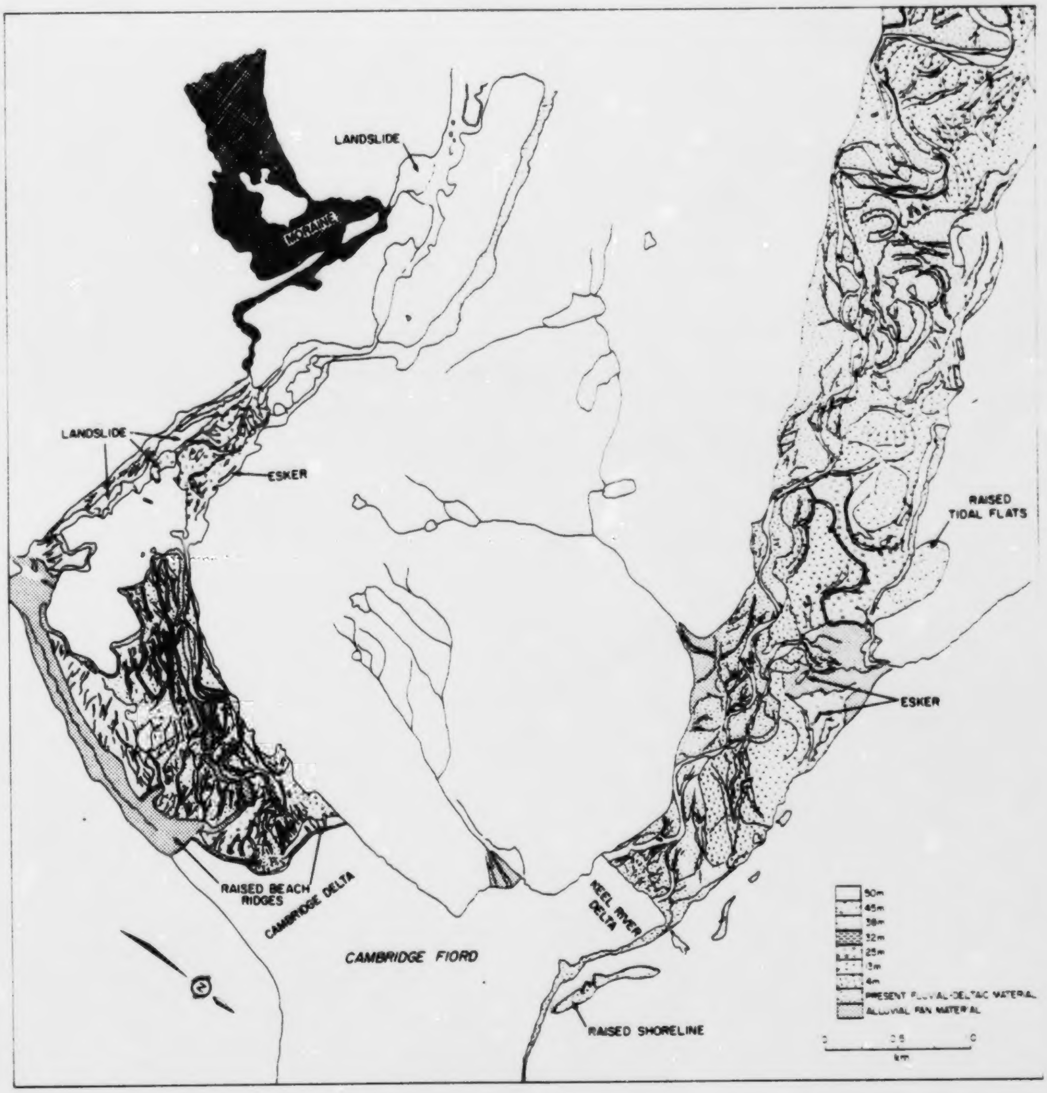

LANDSLIDE
MORAINE
LANDSLIDE
ESKER
RAISED TIDAL FLATS
ESKER
RAISED BEACH RIDGES
CAMBRIDGE DELTA
KEEL RIVER DELTA
CAMBRIDGE FIORD
RAISED SHORELINE
50m
45m
38m
32m
25m
13m
4m
PRESENT FLUVIAL-DELTAIC MATERIAL
ALLUVIAL FAN MATERIAL
0
0.5
1.0
km

Figure 18.18

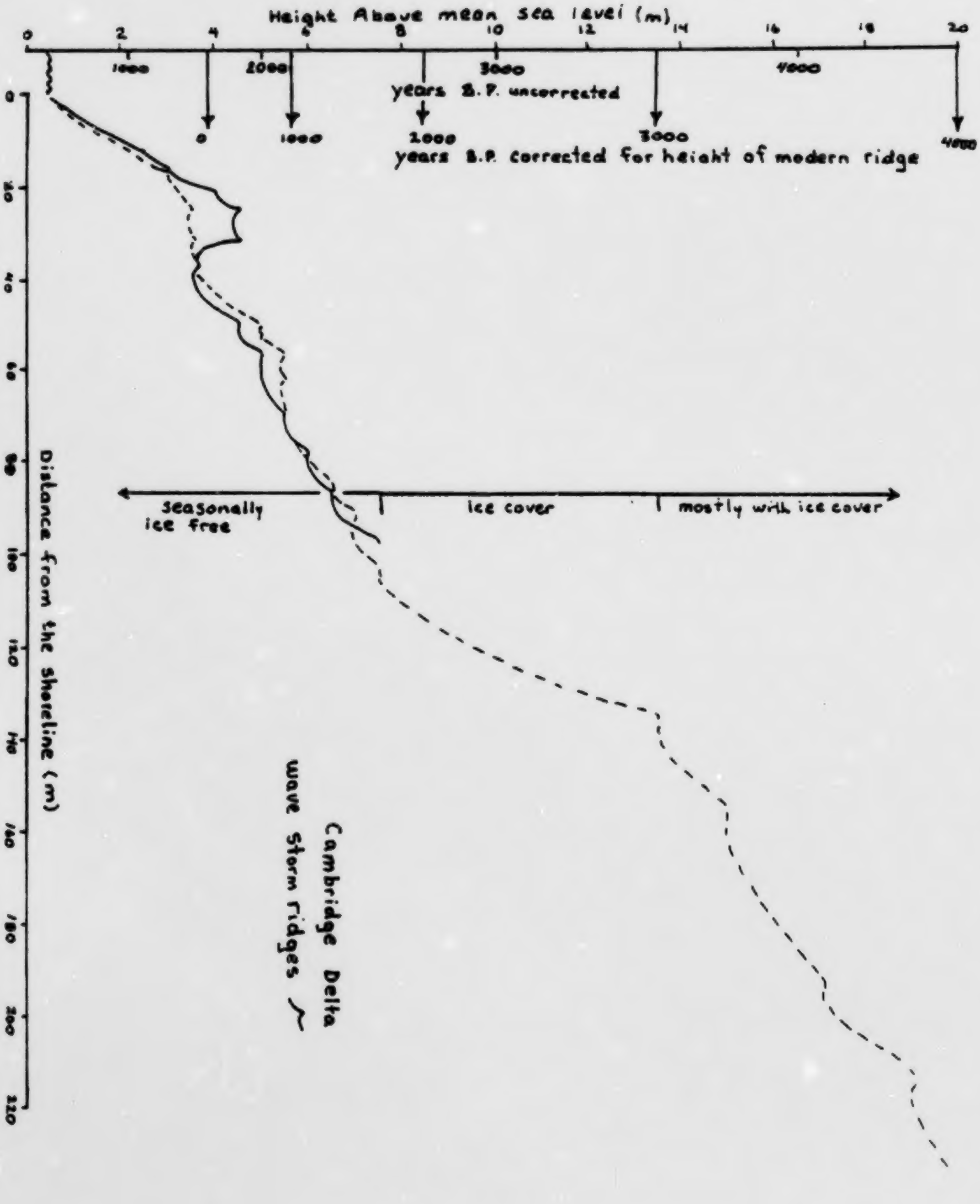

Height Above mean sea level (m)
0
2
4
6
8
10
12
14
16
18
20
1000
2000
3000
4000
years B.P. uncorrected
0
1000
2000
3000
4000
years B.P. corrected for height of modern ridge
0
20
40
60
80
100
120
140
160
180
200
220
Distance from the shoreline (m)
seasonally ice free
ice cover
mostly with ice cover
Cambridge Delta
wave storm ridges

Figure 18.19

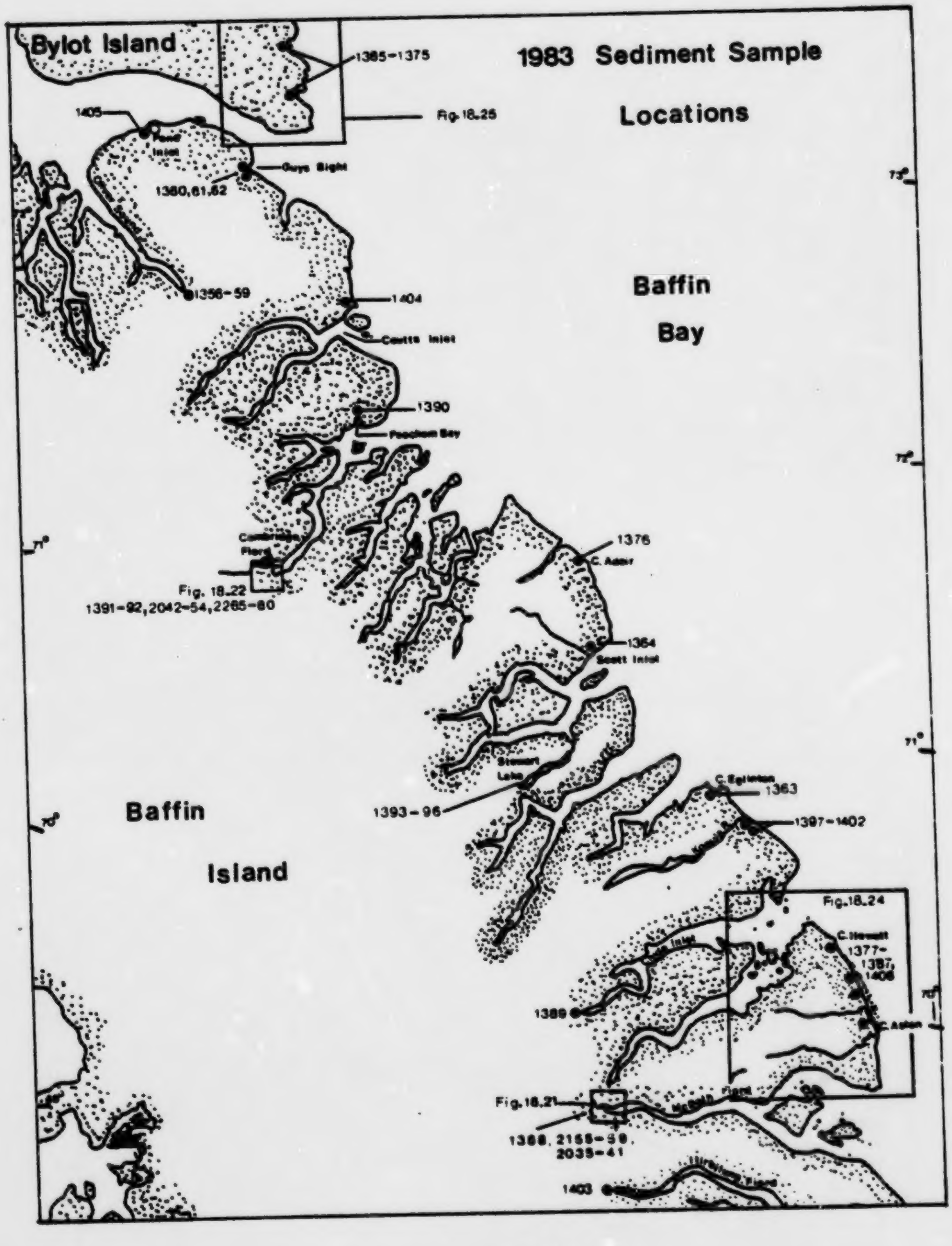
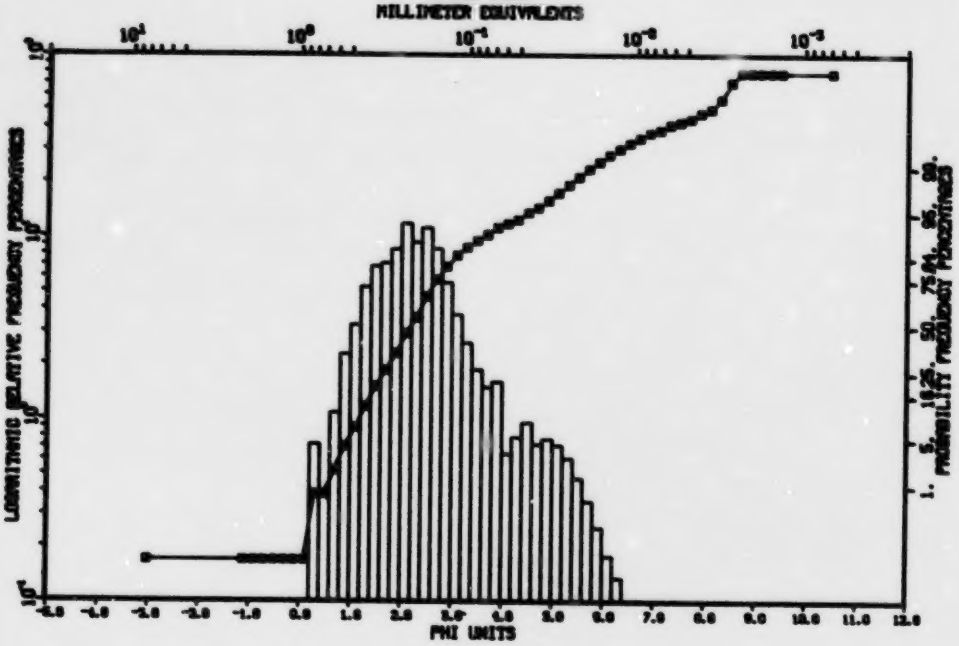

1983 Sediment Sample
Locations
Bylot Island
1385-1375
Fig. 18.25
1405
Pond Inlet
Guys Bight
1360,61,62
73°
1356-59
1404
Coutts Inlet
Baffin
Bay
1390
Paquet Bay
72°
71°
Fig. 18.22
1391-92,2042-54,2265-80
1376
C. Adair
1364
Scott Inlet
71°
Stewart
Lake
1393-96
C. Eglinton
1363
1397-1402
70°
Baffin
Island
Fig.18.24
C.Hewett
1377-
1387,
1406
70°
C. Aston
1389
Fig.18.21
1388, 2155-59,
2035-41
Fiord
1403

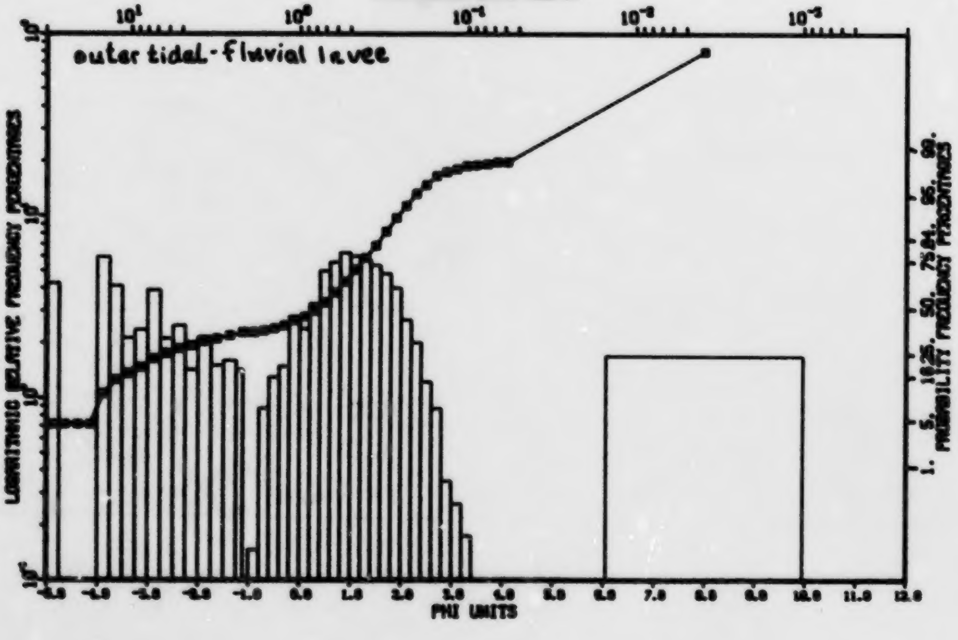
Figure 18.20

OLIVER SOUND # 1 FLOOD FALL DEPOSIT
SAMPLE 1358

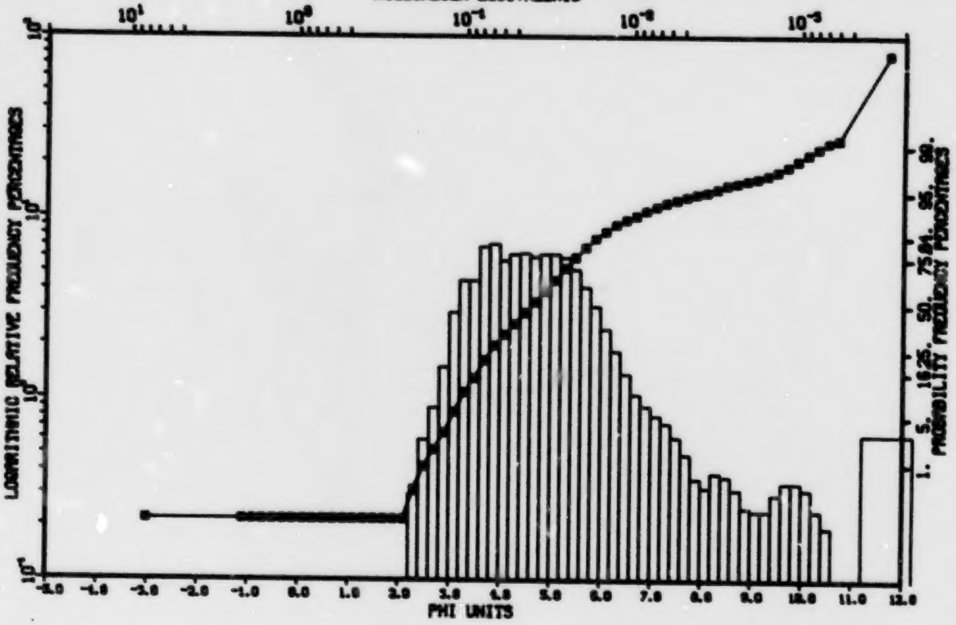


Oliver Sound #2

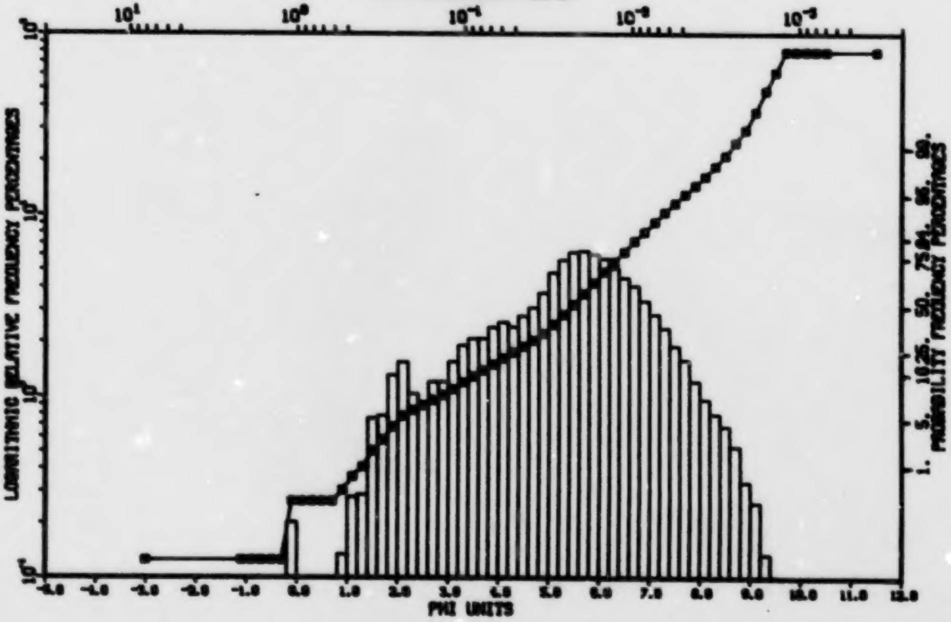
LEVEE (<63 MICRON FRACTION SAVED)
SAMPLE NUMBER- 1357


outer tidal-fluvial levee

OLIVER SOUND = 3 LOW STAGE TIDAL CHANNEL
SAMPLE 1358
MILLIMETER EQUIVALENTS



OLIVER SOUND GREY SILT
SAMPLE 1360
MILLIMETER EQUIVALENTS



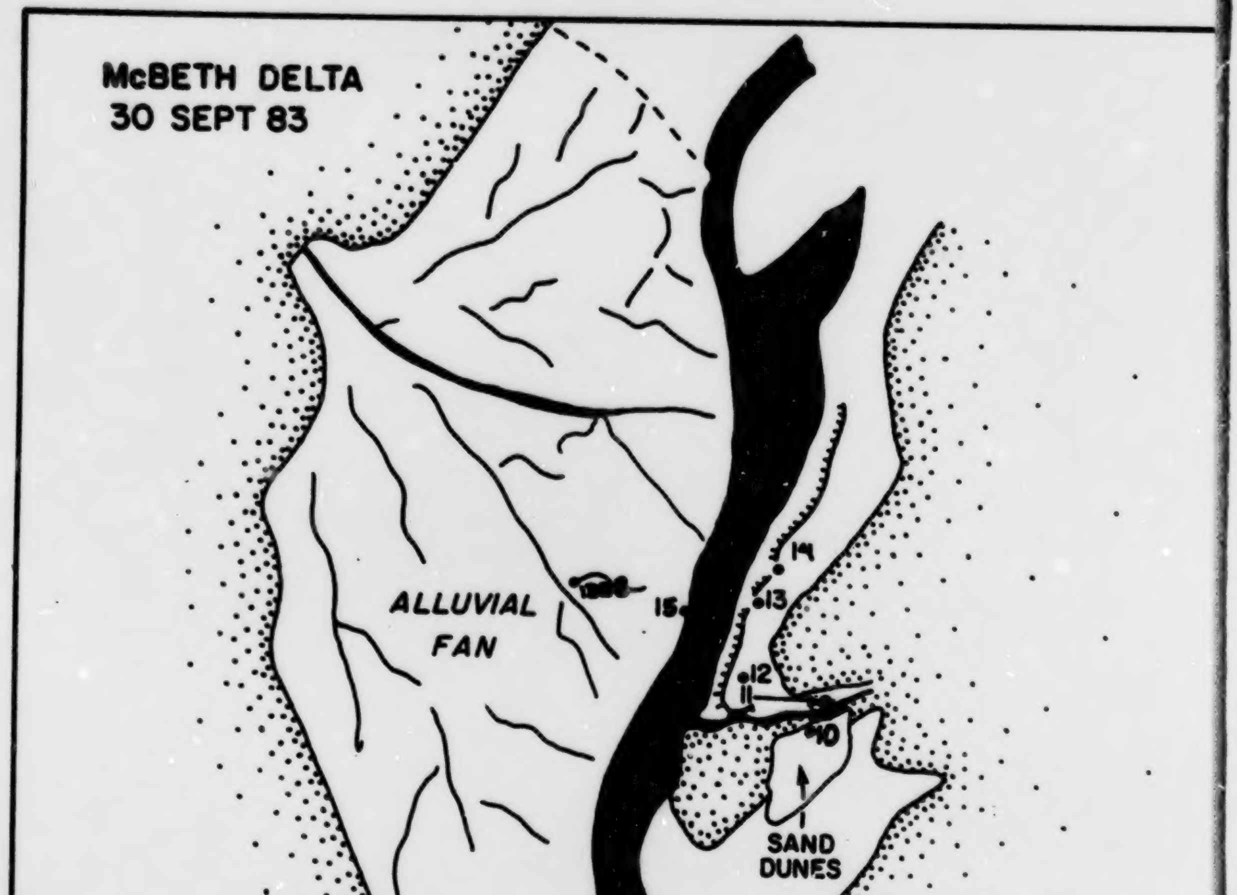
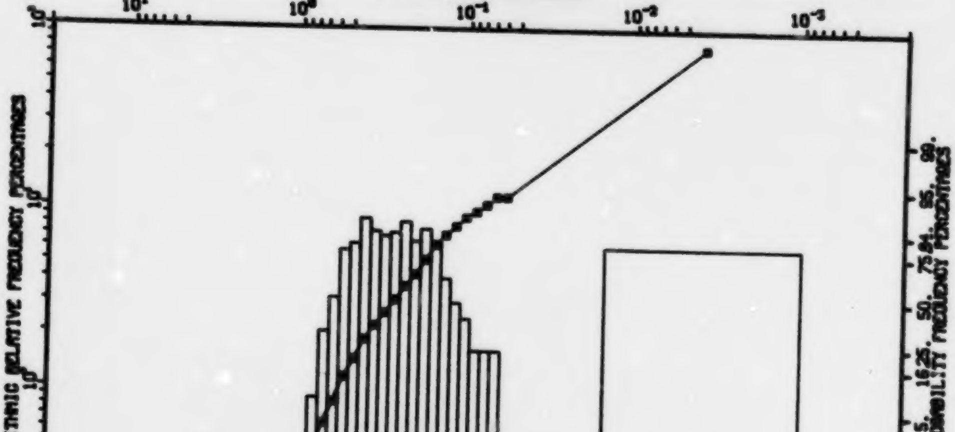
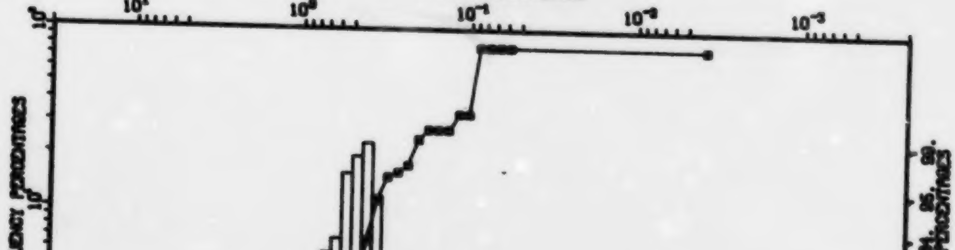
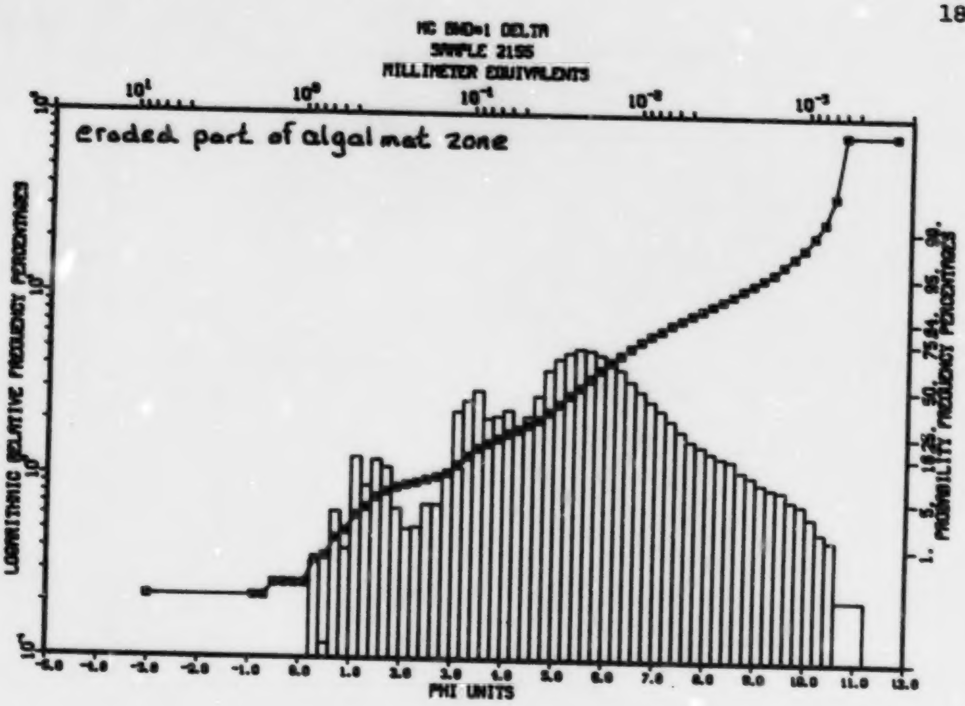
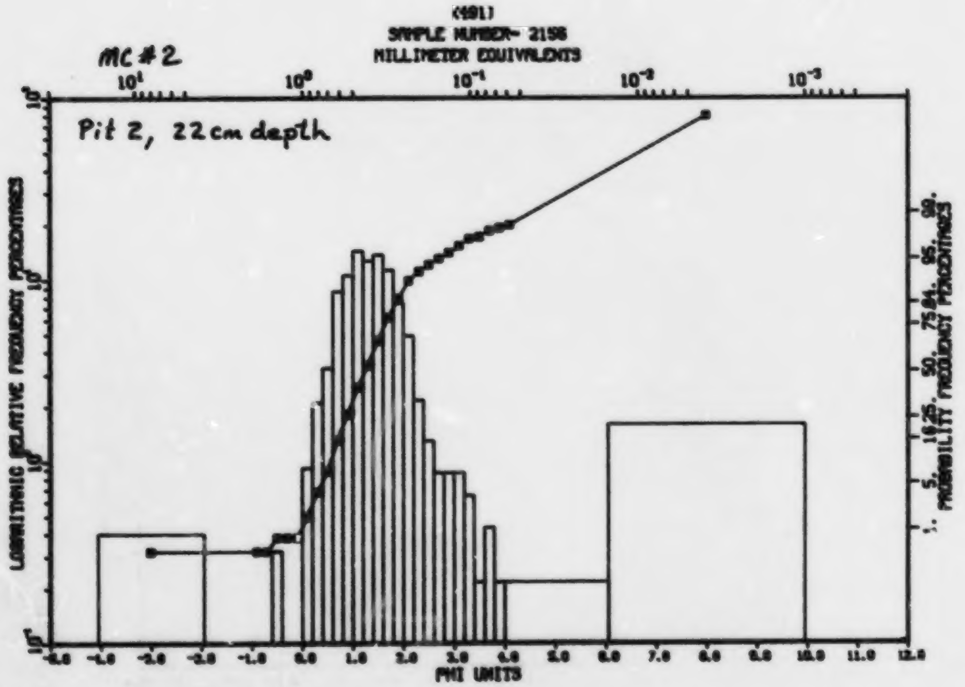

McBETH DELTA
30 SEPT 83
ALLUVIAL FAN
15
14
13
12
11
10
SAND DUNES
9
8
7
3
PIT 2
PIT 3
PIT 1
1
0
1
KILOMETRE
WATER LINE (LOW TIDE)

Figure 18.21

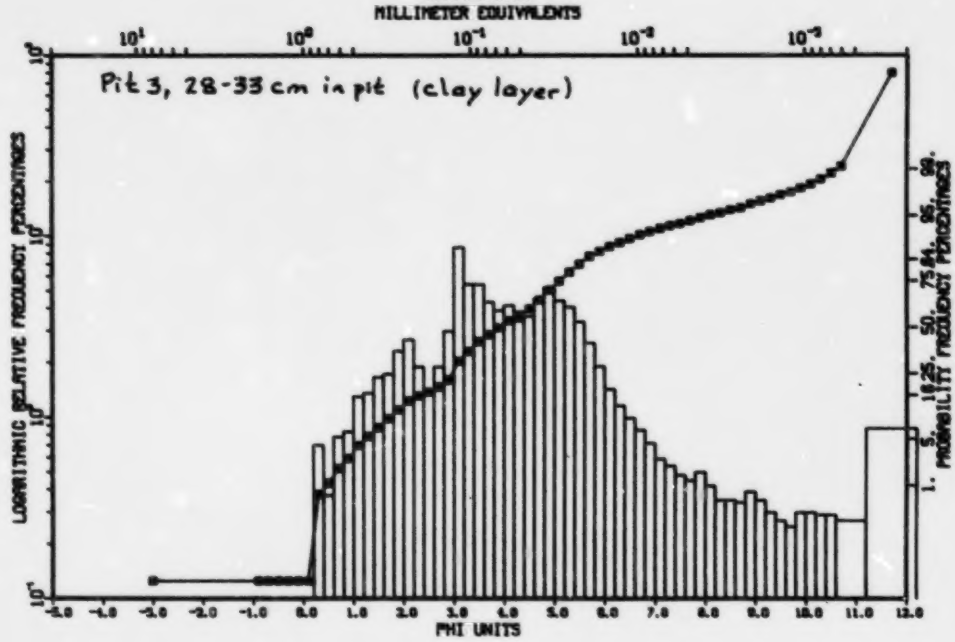

HOBETH • 1 ALLUVIAL FAN CHANNEL SAND
SAMPLE NUMBER- 1300
MILLIMETER EQUIVALENTS


CLYDE DELTA • 1 WAVE WASHOVER BAR
SAMPLE NUMBER- 1300
MILLIMETER EQUIVALENTS


MC BND=1 DELTA
SAMPLE 2155
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
eroded part of algal mat zone
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
PHI UNITS
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0


(491)
SAMPLE NUMBER- 2156
MILLIMETER EQUIVALENTS
MC #2
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Pit 2, 22cm depth
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
PHI UNITS
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0

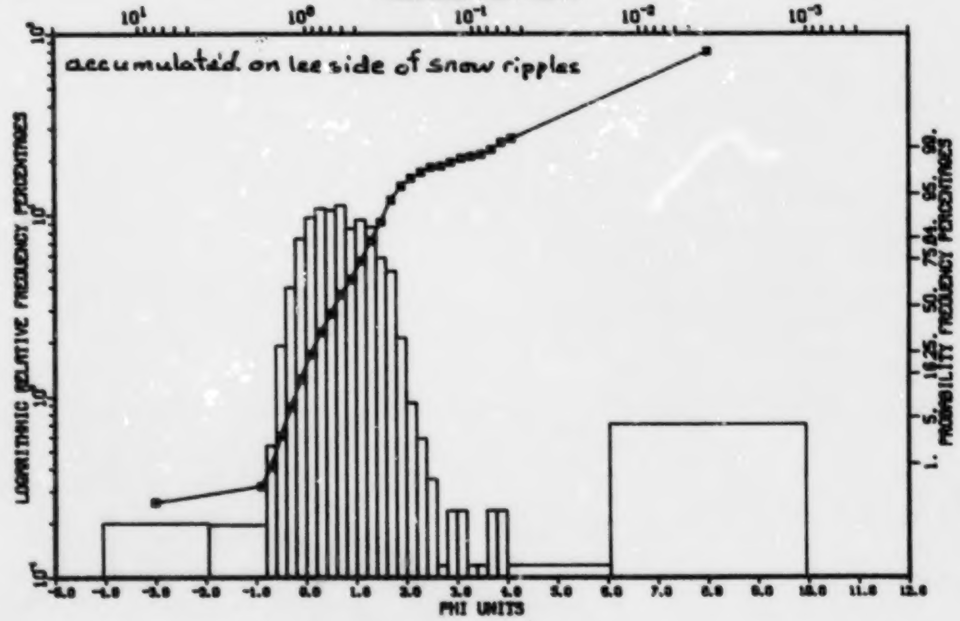
MC BND=3.5 DELTA
SAMPLE 2158



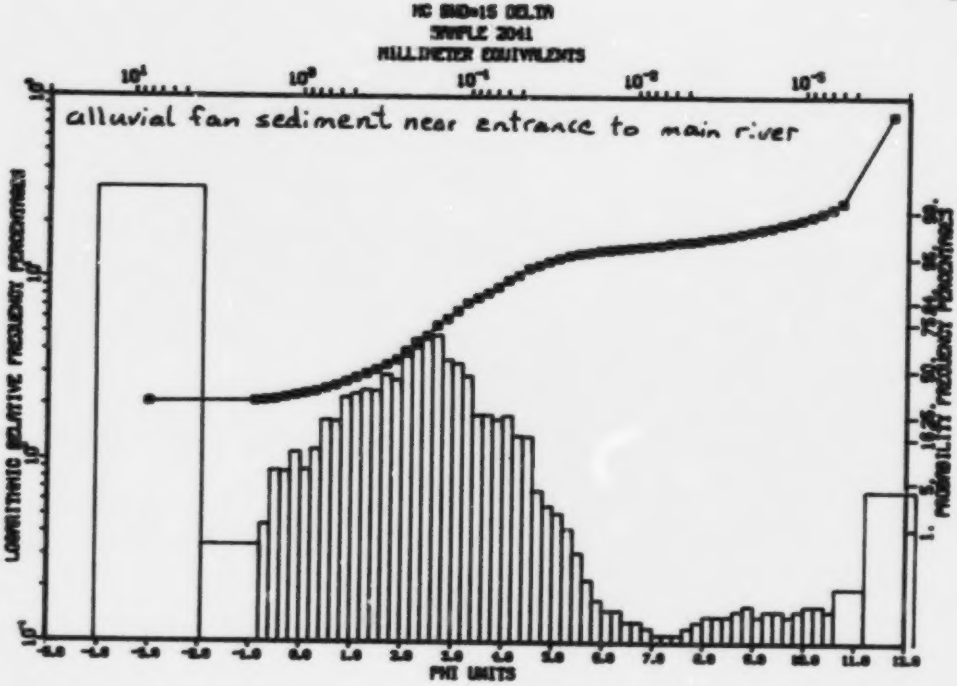
Pit 3, 28-33 cm in pit (clay layer)

mc#3

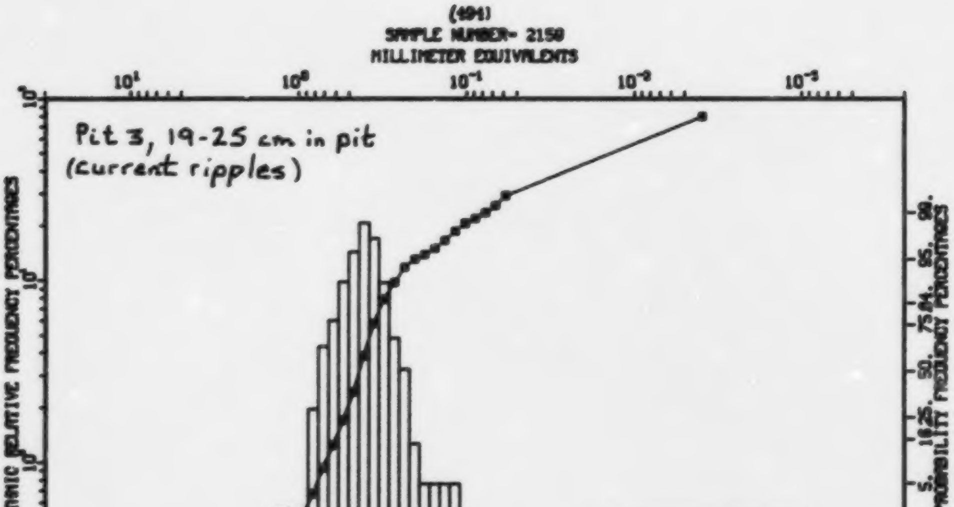
(192)
SAMPLE NUMBER- 2157



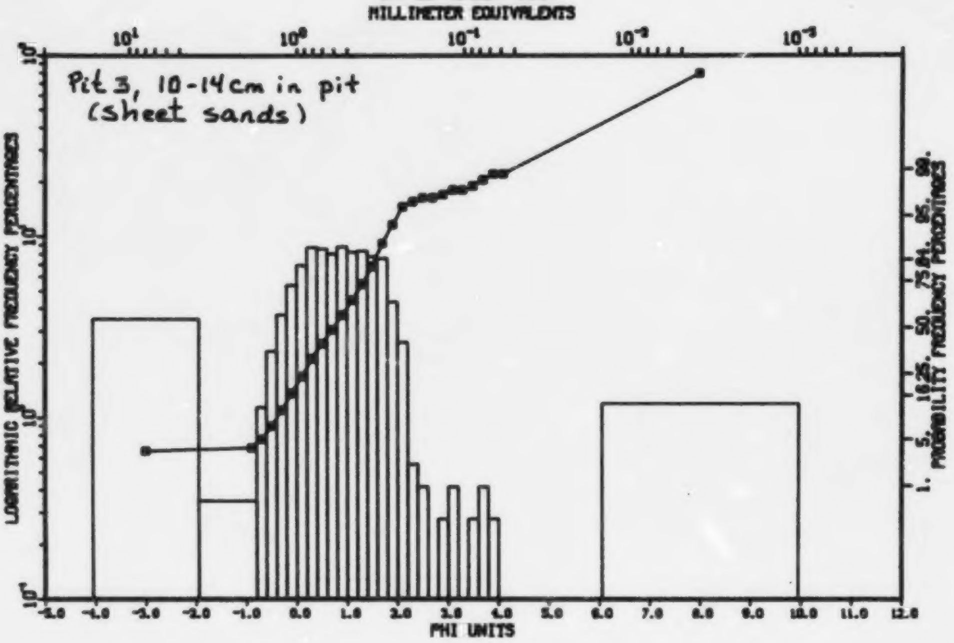
accumulated on lee side of snow ripples

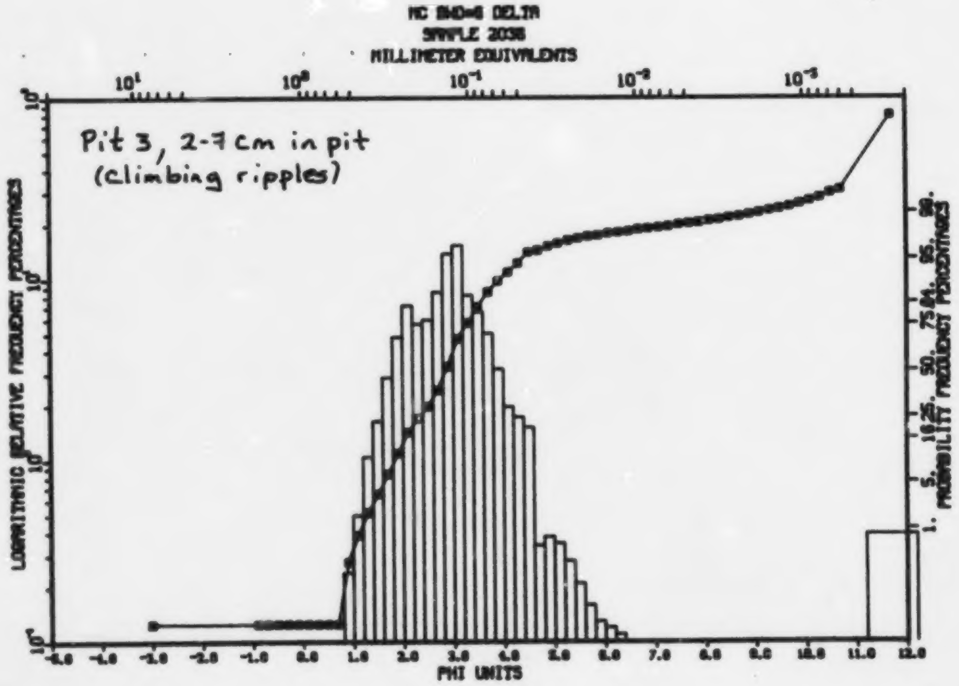


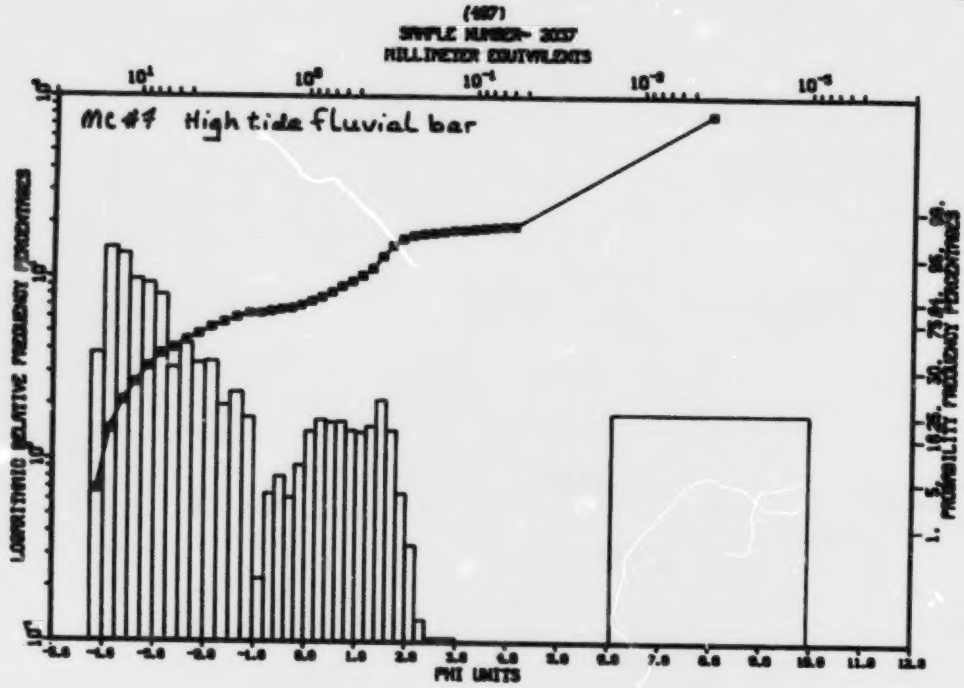
alluvial fan sediment near entrance to main river



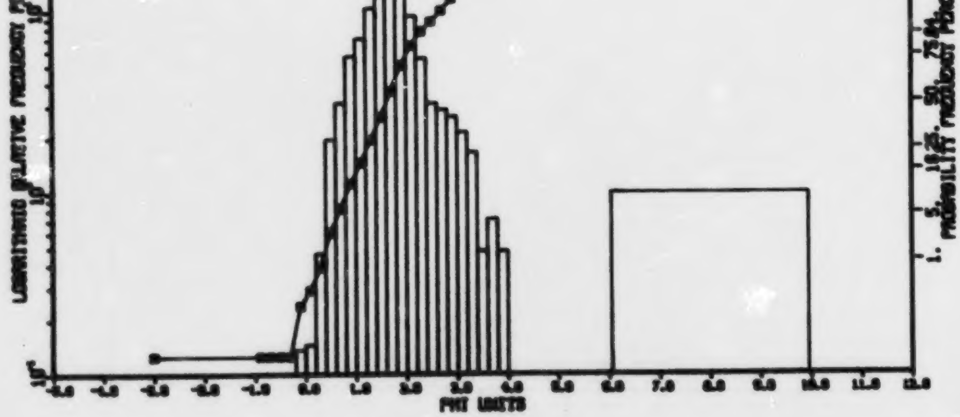
Pit 3, 19-25 cm in pit
(current ripples)


SAMPLE NUMBER- 2035
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Pit 3, 10-14 cm in pit
(sheet sands)
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


NC BHD=6 DELTA
SAMPLE 2036
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Pit 3, 2-7 cm in pit
(climbing ripples)
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

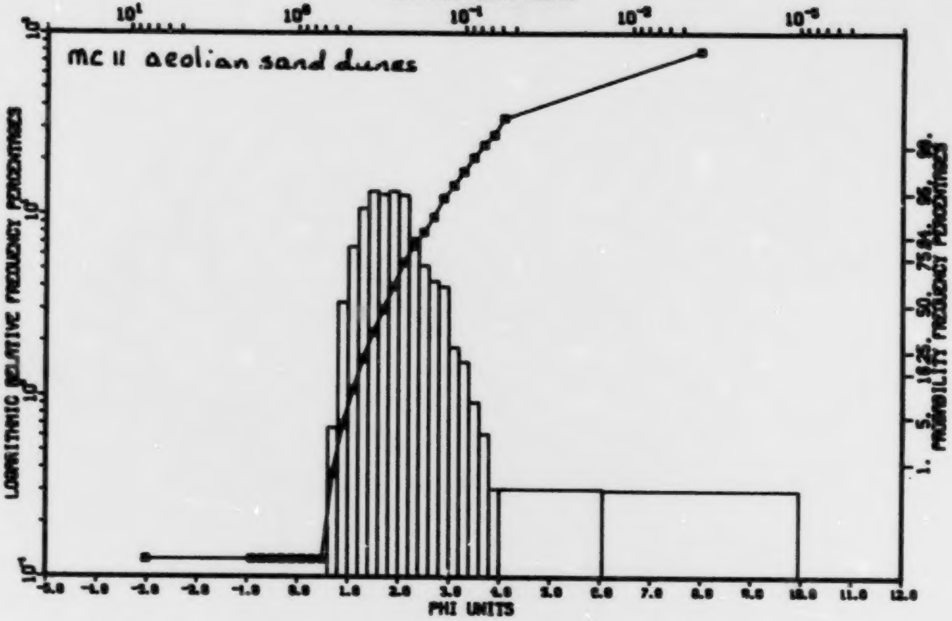


MC#7 High tide fluvial bar

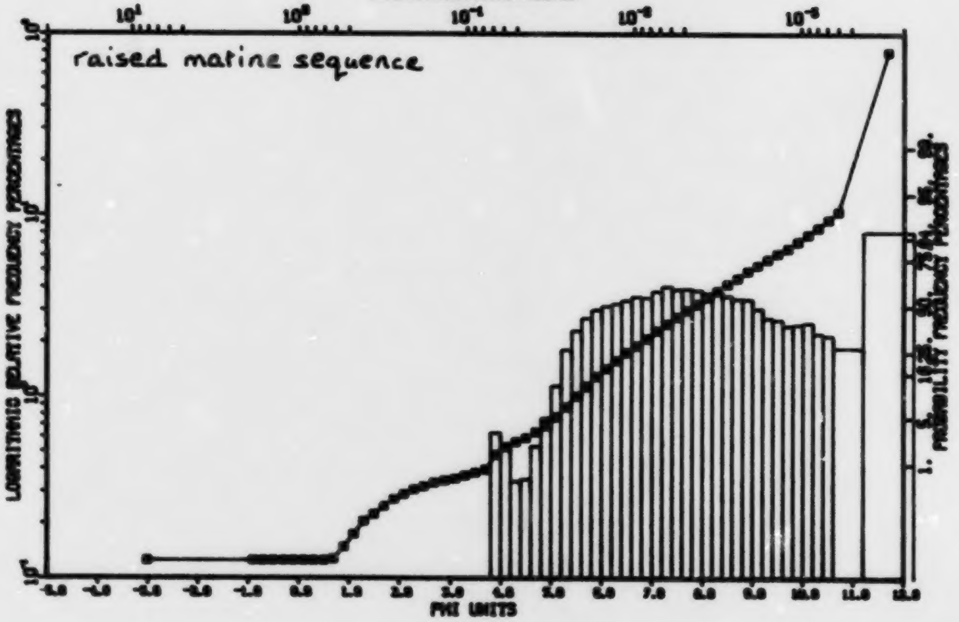


MC#9 aeolian sands on snow
On lee side of peninsula

(2285)
SAMPLE NUMBER- 2039
MILLIMETER EQUIVALENTS



MC BAD-12 DELTA
SAMPLE 2040
MILLIMETER EQUIVALENTS



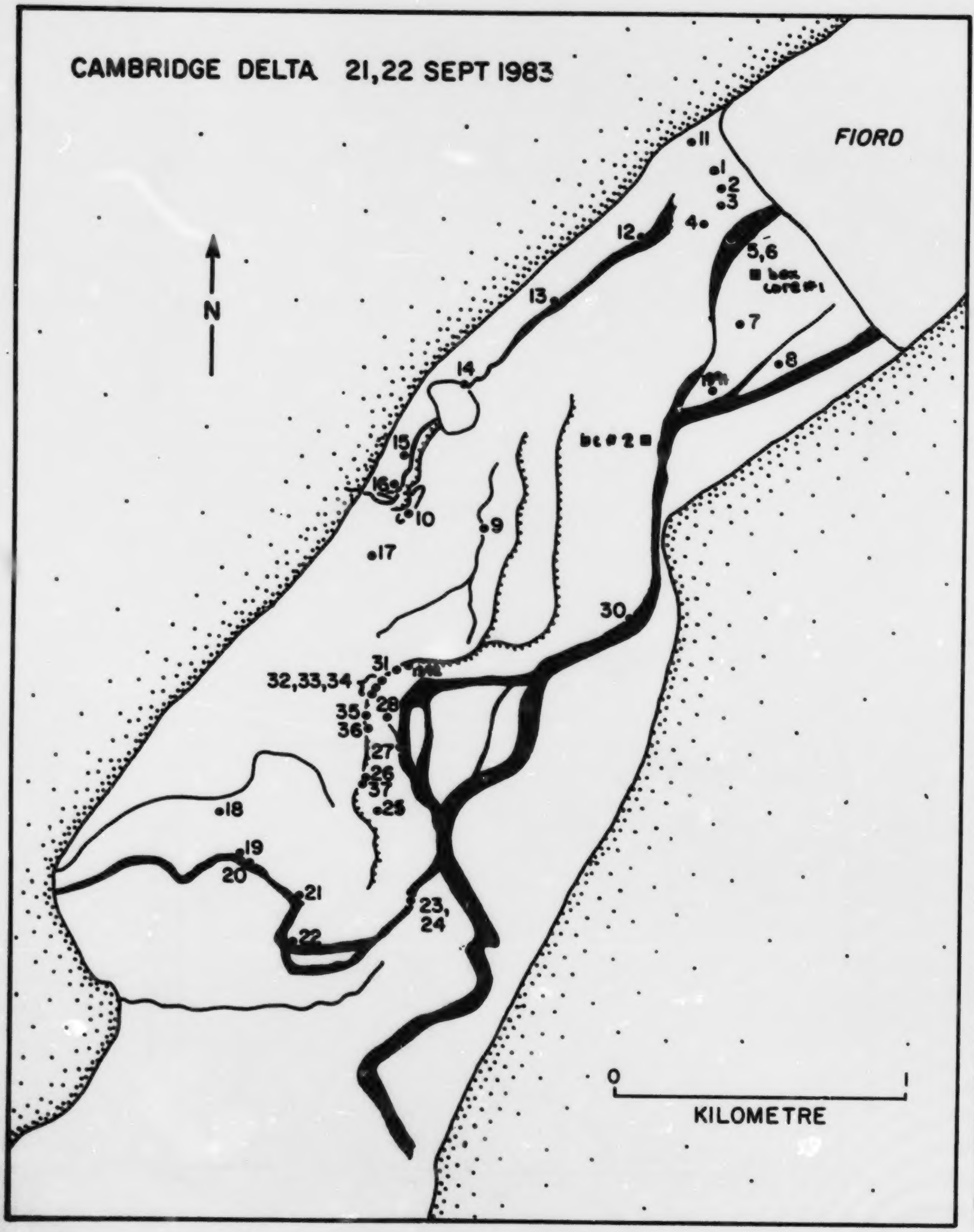
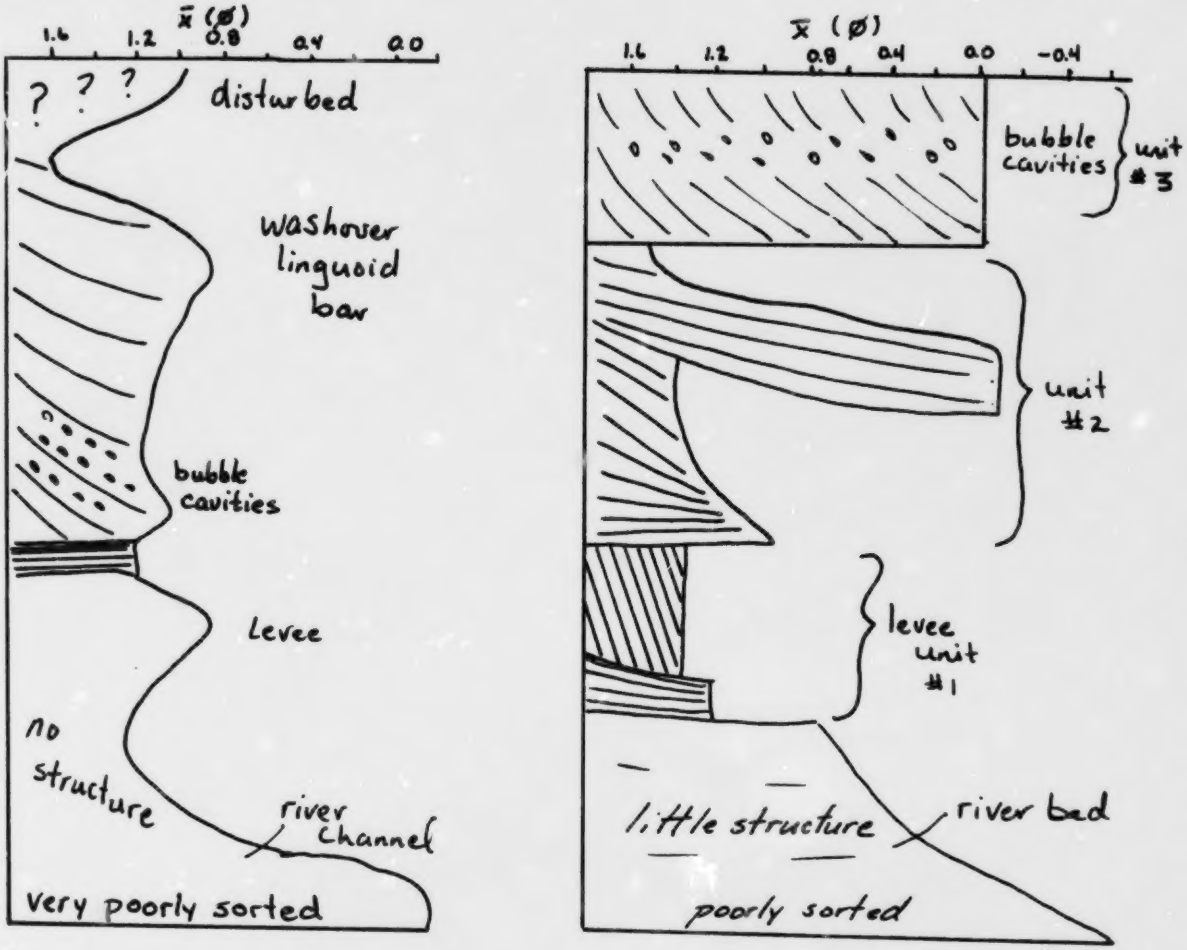

CAMBRIDGE DELTA 21,22 SEPT 1983
FIORD
N
11
1
2
3
4
12
5,6
box core#1
13
7
14
8
bc#2
15
16
10
9
17
30
31
32,33,34
28
35
36
27
26
37
25
18
19
20
21
22
23,
24
0
1
KILOMETRE

Figure 18.22



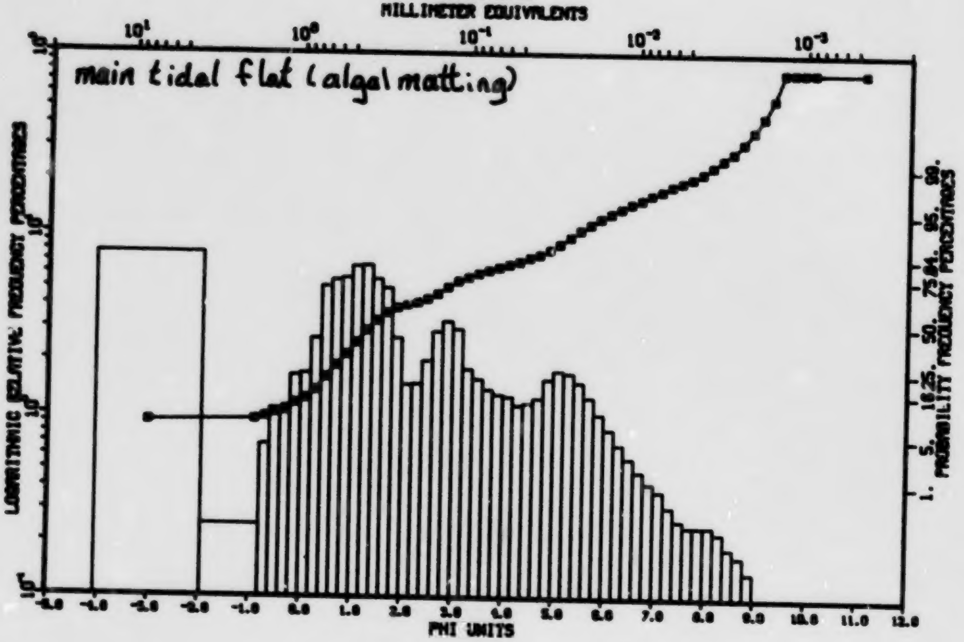
Box Core #1

Box Core #2

Keel River Delta, Cambridge Fiord

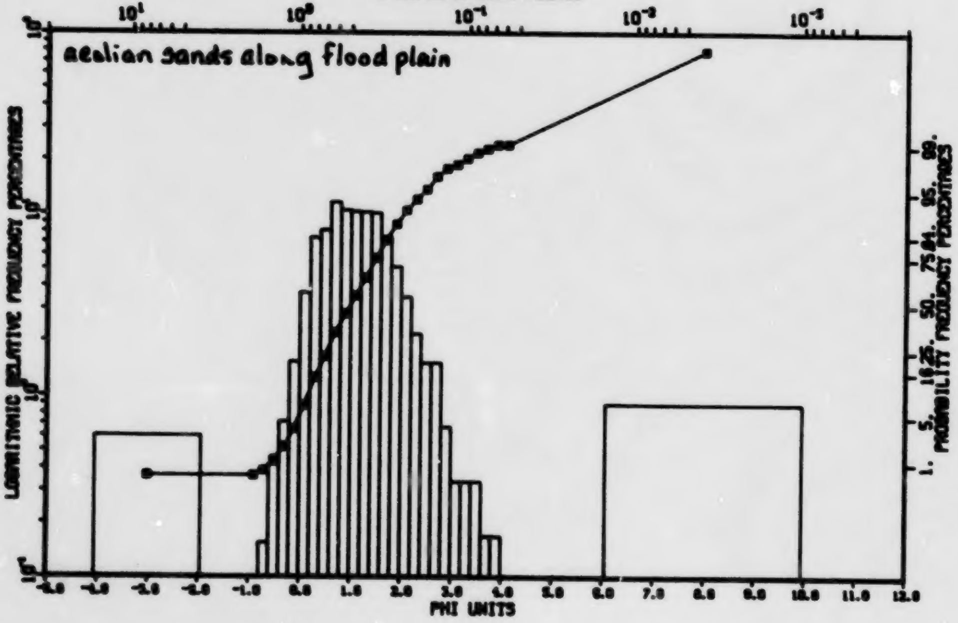
Figure 18.23

GA-D#7 DELTA
SAMPLE 2042



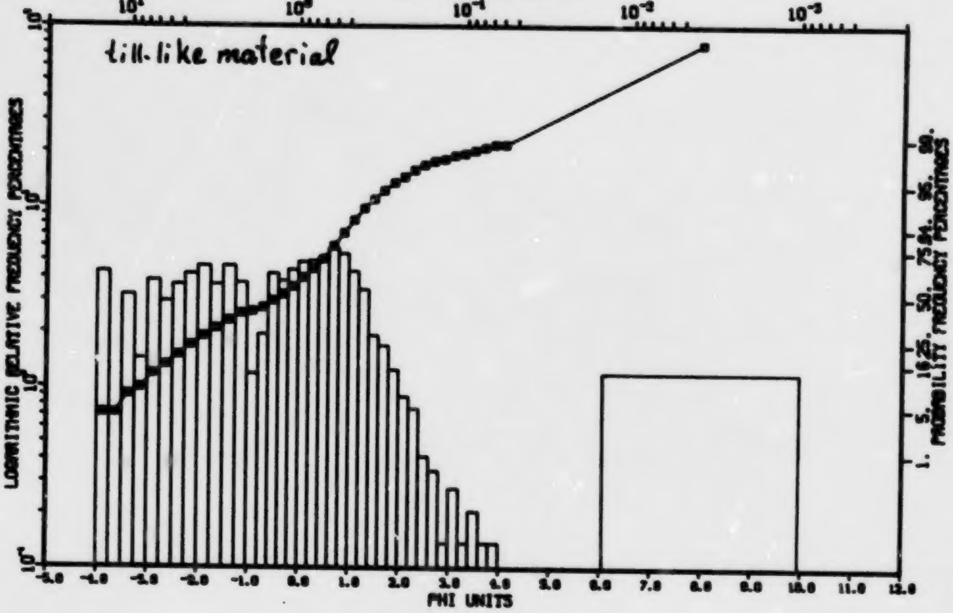
GA-D#8

24281
SAMPLE NUMBER- 2043



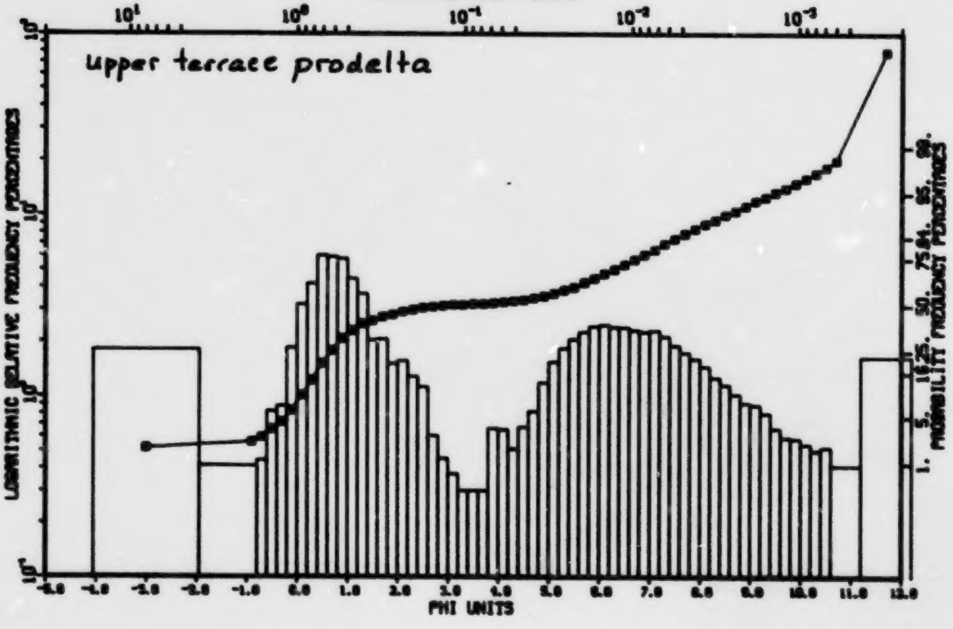
CA-D #10

124301
SAMPLE NUMBER- 2044
MILLIMETER EQUIVALENTS

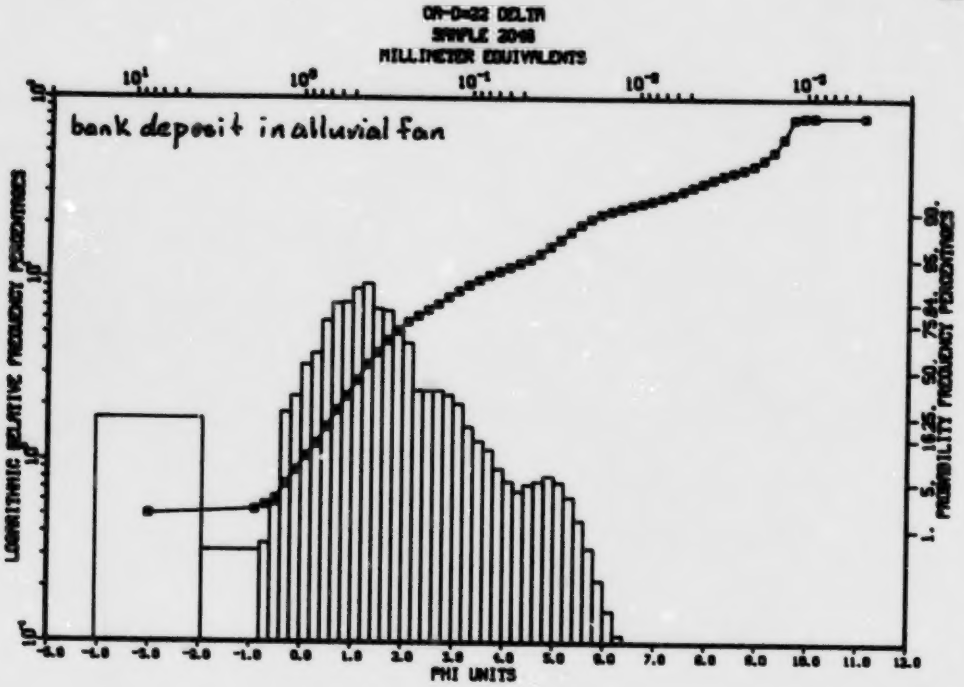


till-like material

CA-D#17 DELTA
SAMPLE 2045
MILLIMETER EQUIVALENTS

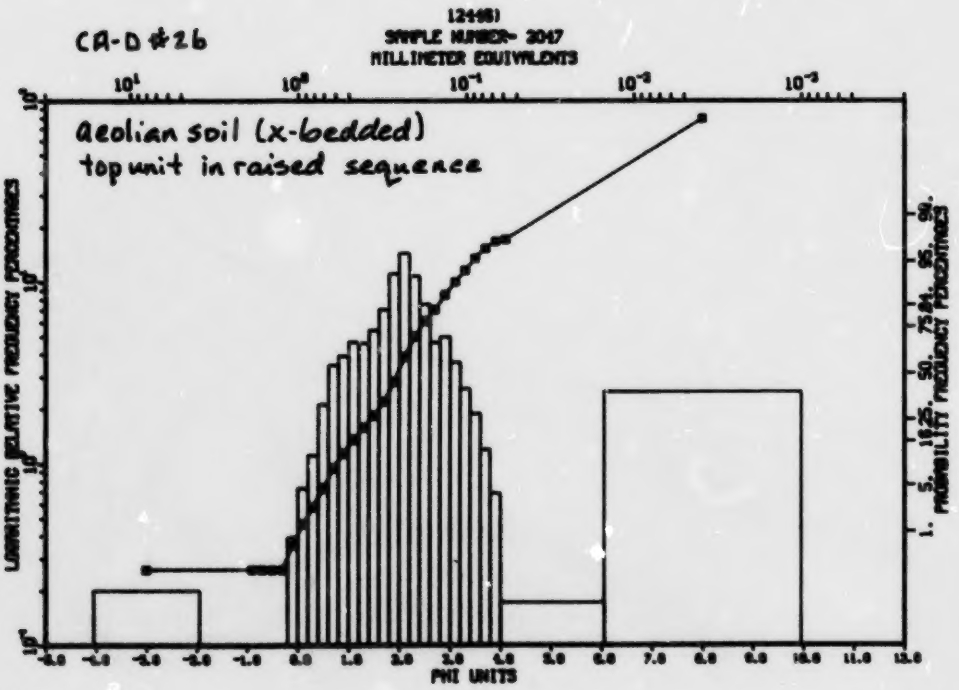


upper terrace prodelta



bank deposit in alluvial fan

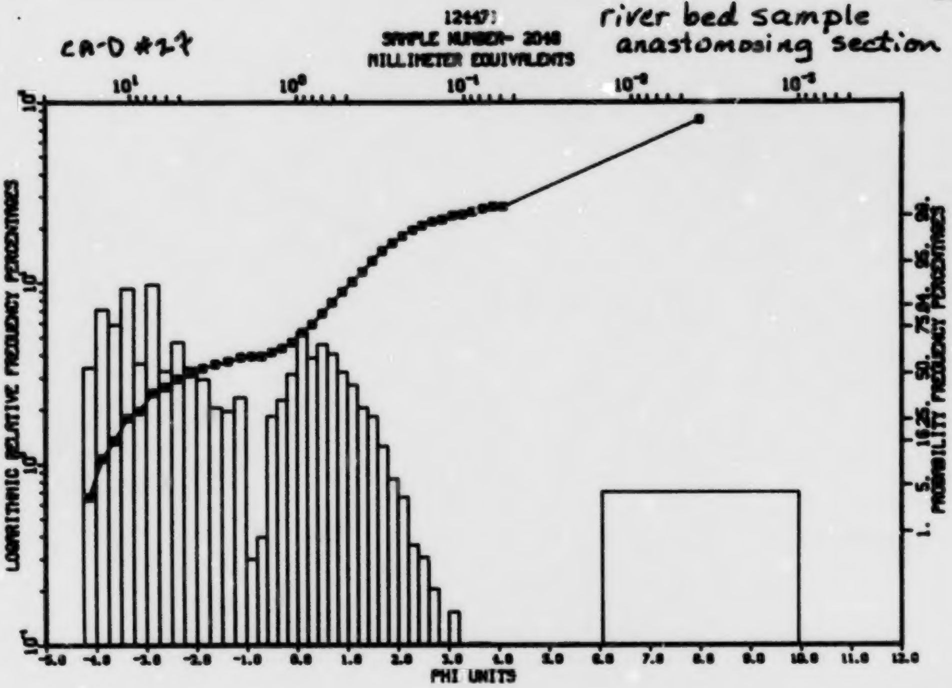
CA-D #26



aeolian soil (x-bedded)
top unit in raised sequence

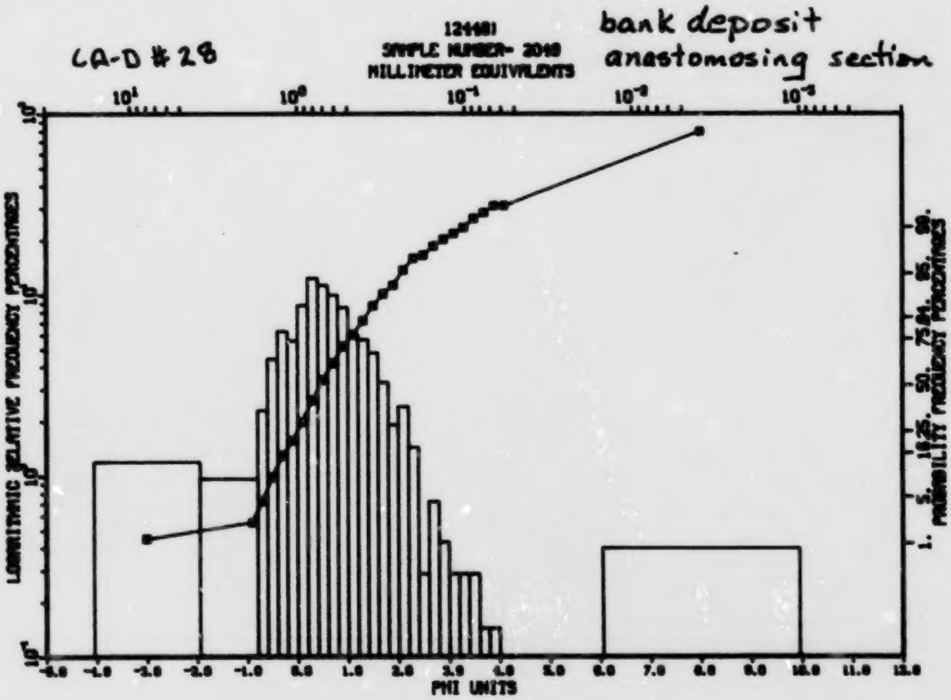
CA-D #27

river bed sample
anastomosing section

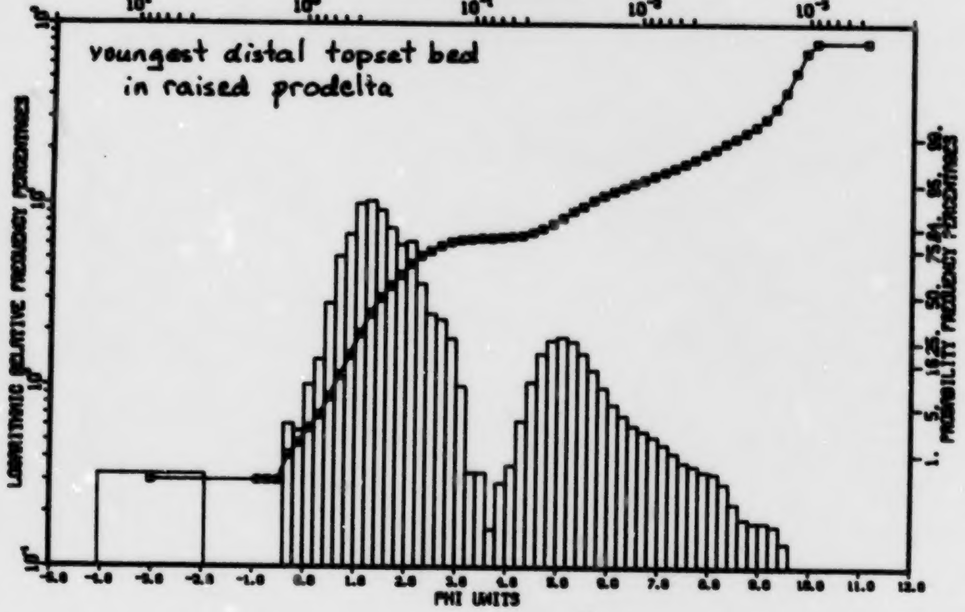


bank deposit
anastomosing section

CA-D #28

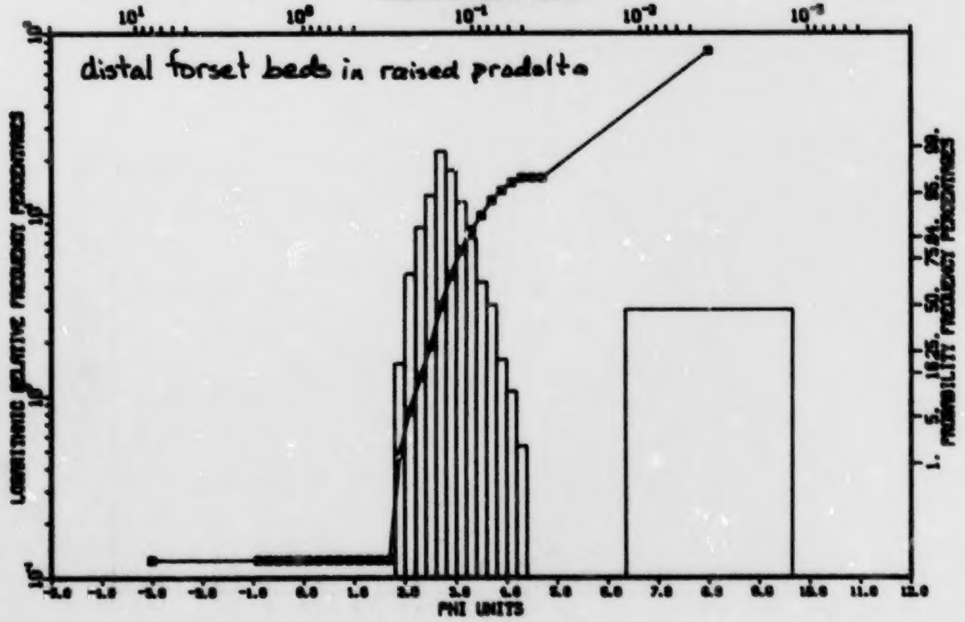


CA-D#31 DELTA
SAMPLE 2050
MILLIMETER EQUIVALENTS


youngest distal topset bed
in raised prodelta

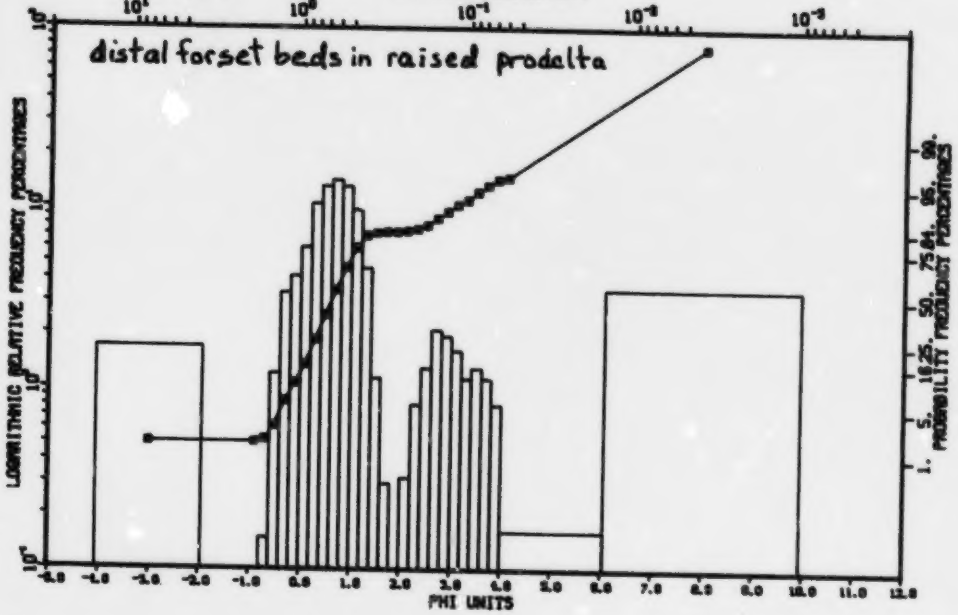
CA-D #22

12[illegible]21
SAMPLE NUMBER- 2051
MILLIMETER EQUIVALENTS

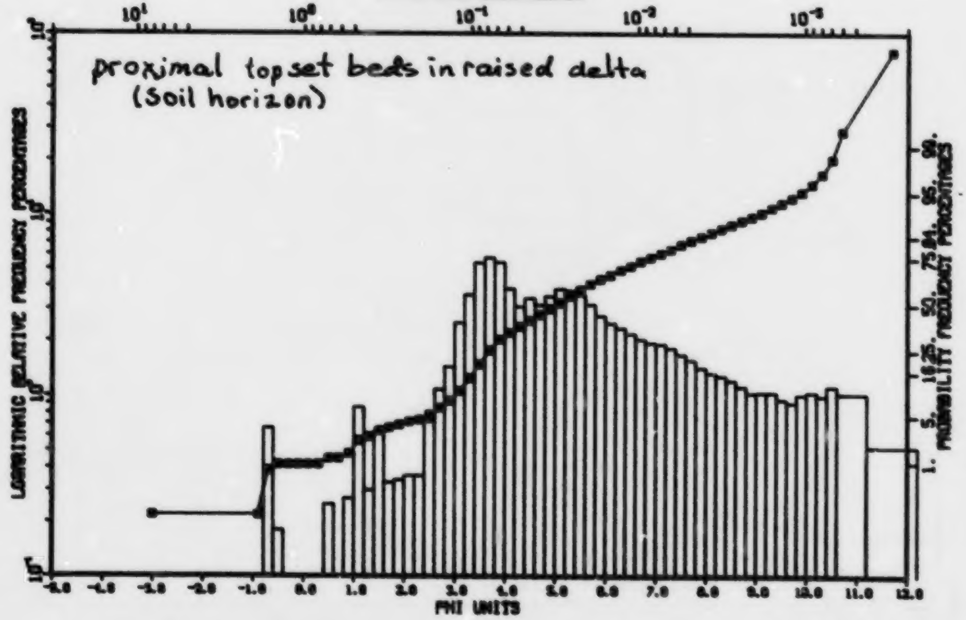

distal forset beds in raised prodelta

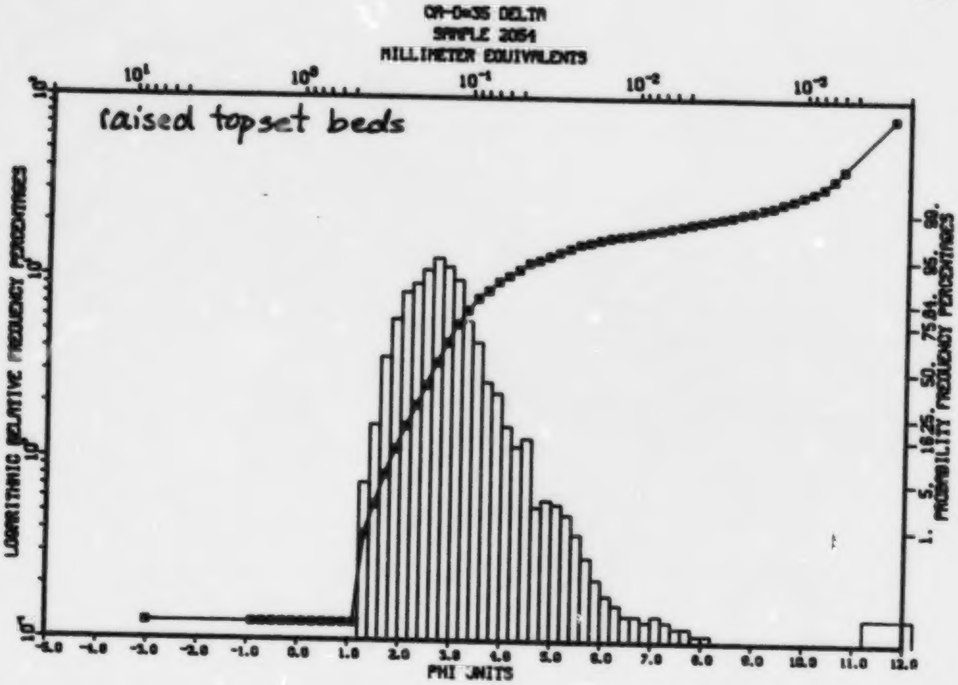
12(53)
SAMPLE NUMBER- 2052
MILLIMETER EQUIVALENTS

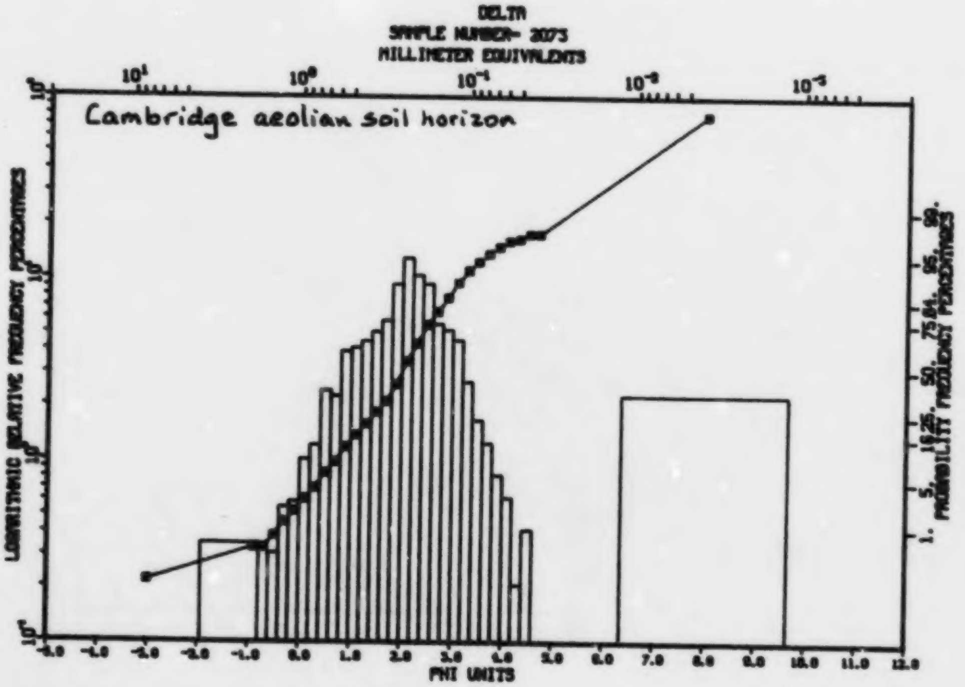
CA-D #33


distal forset beds in raised prodelta

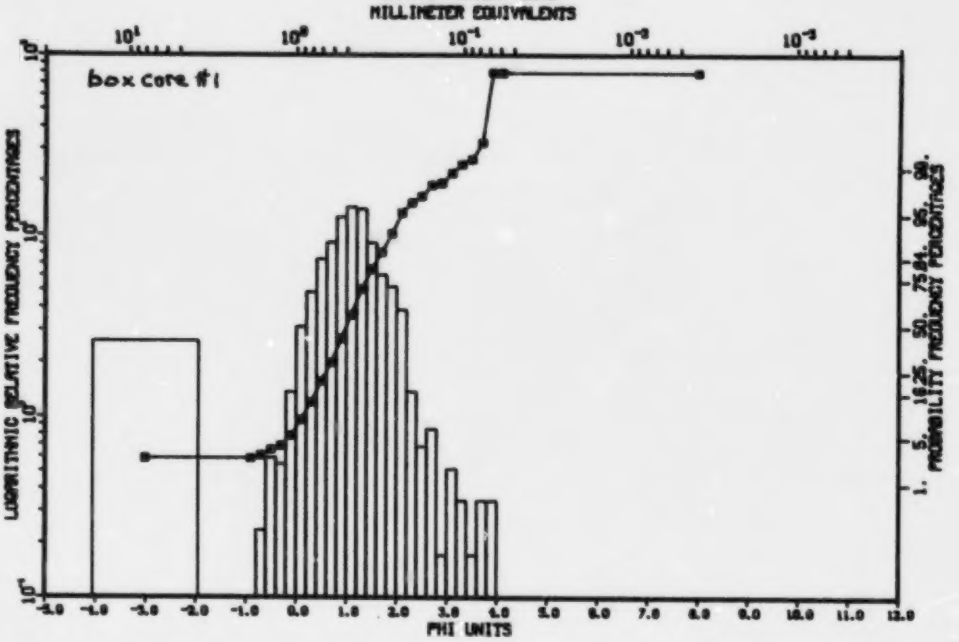
CA-D#34 DELTA
SAMPLE 2053
MILLIMETER EQUIVALENTS


proximal topset beds in raised delta
(Soil horizon)

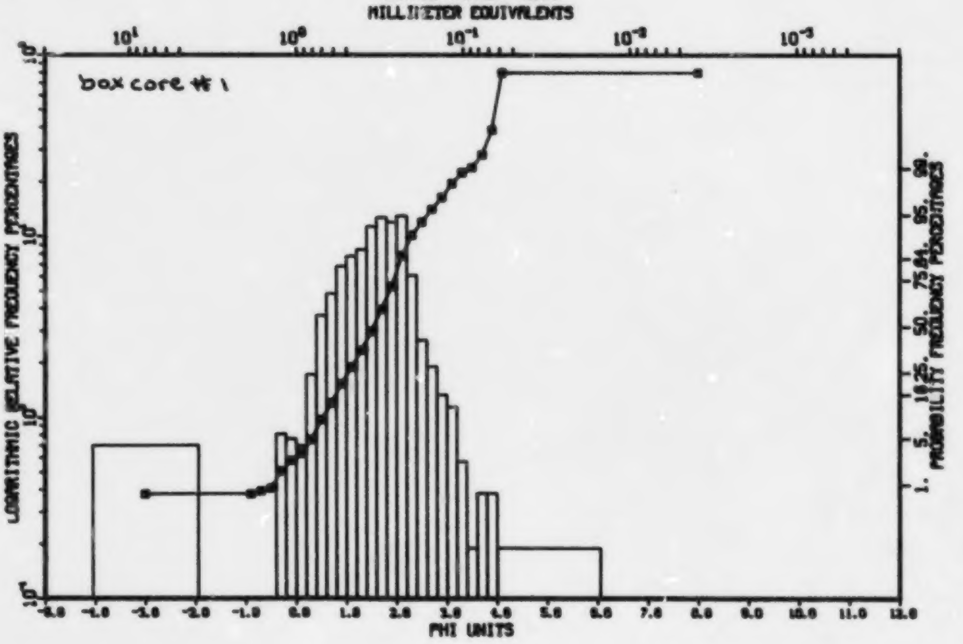

QR-D=35 DELTA
SAMPLE 2054
MILLIMETER EQUIVALENTS
raised topset beds
10¹
10⁰
10⁻¹
10⁻²
10⁻³
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


DELTA
SAMPLE NUMBER- 2073
MILLIMETER EQUIVALENTS
Cambridge aeolian soil horizon
10¹
10⁰
10⁻¹
10⁻²
10⁻³
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

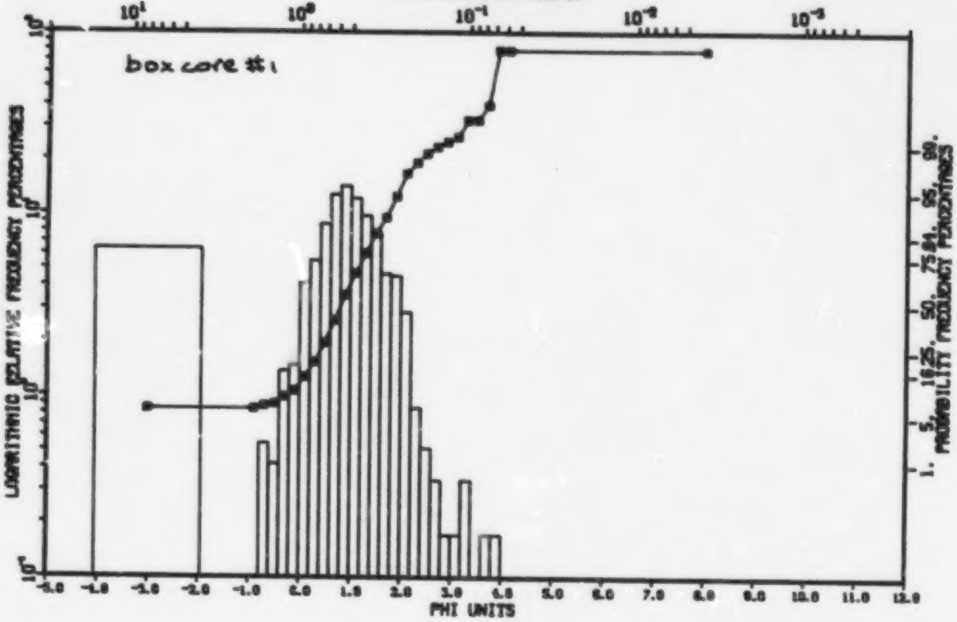
CAMBRIDGE=1 0-3 CM PEEL CORE 83-028
SAMPLE NUMBER- 2285



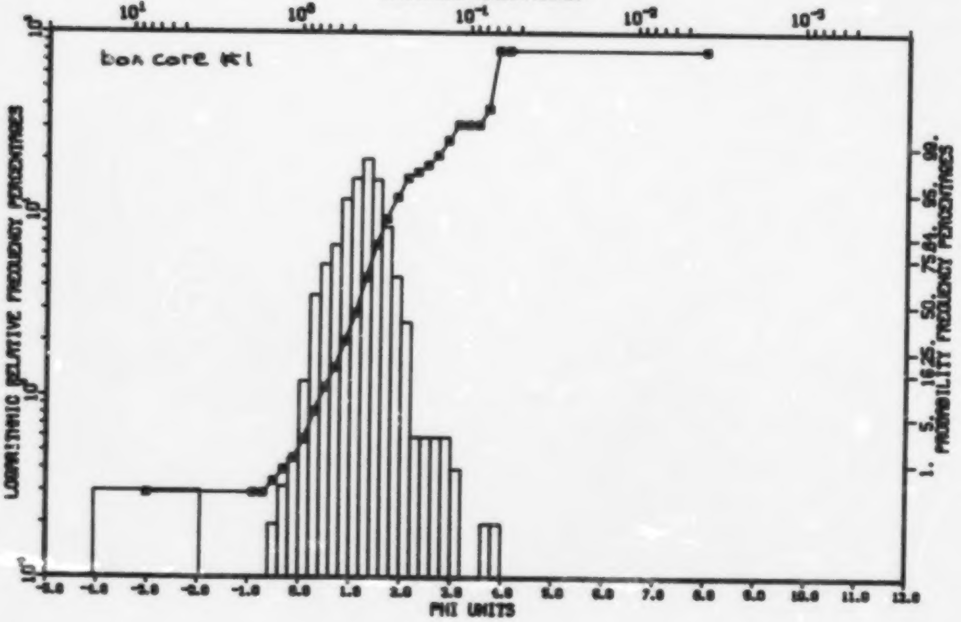
CAMBRIDGE=2 6-9 CM PEEL CORE 83-028
SAMPLE NUMBER- 2286

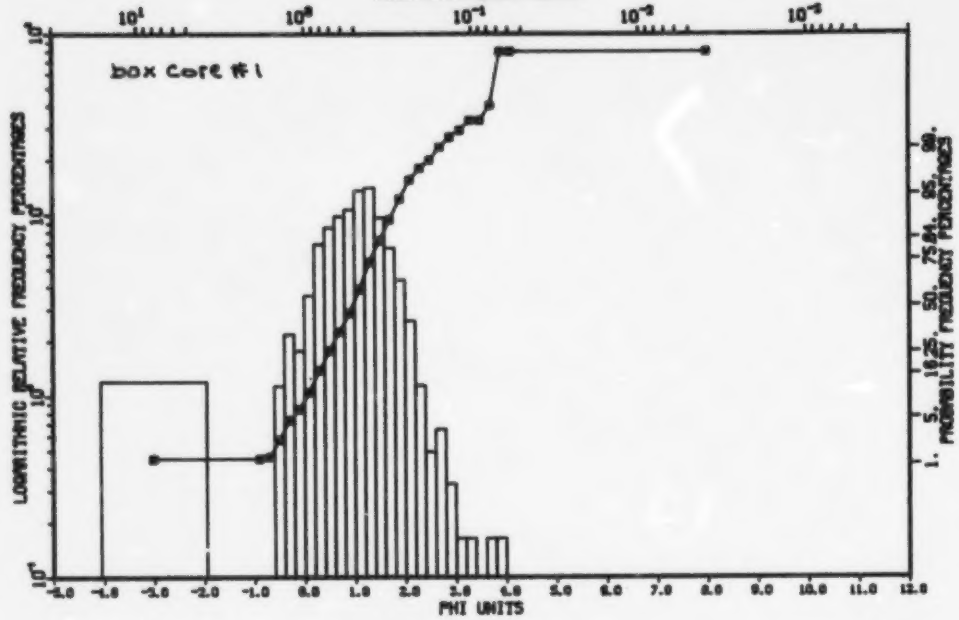


CAMBRIDGE*3 13-16 CM PEEL CORE 83-028
SAMPLE NUMBER- 2287
MILLIMETER EQUIVALENTS

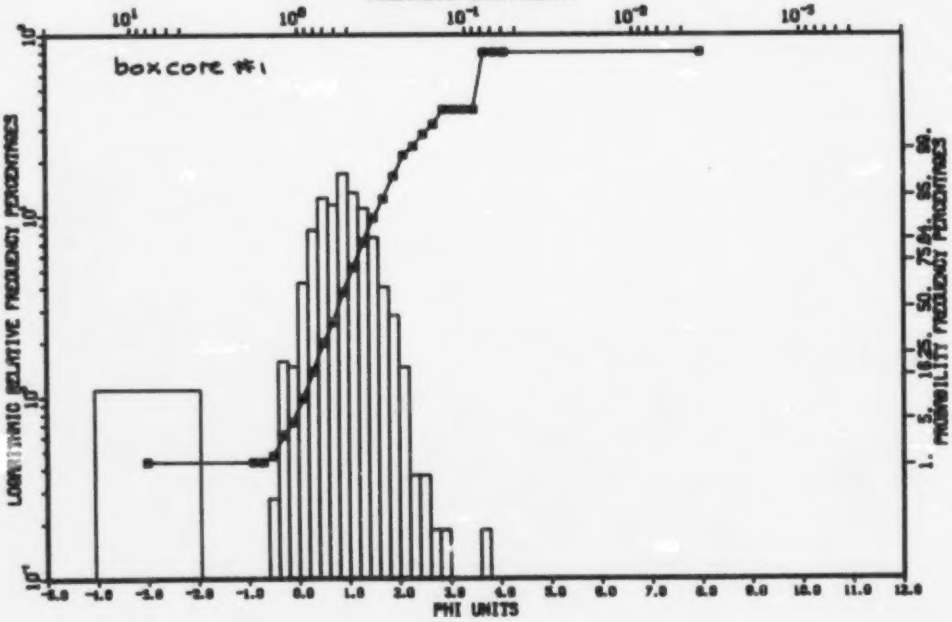


CAMBRIDGE*4 27-30 CM PEEL CORE 83-028
SAMPLE NUMBER- 2288
MILLIMETER EQUIVALENTS



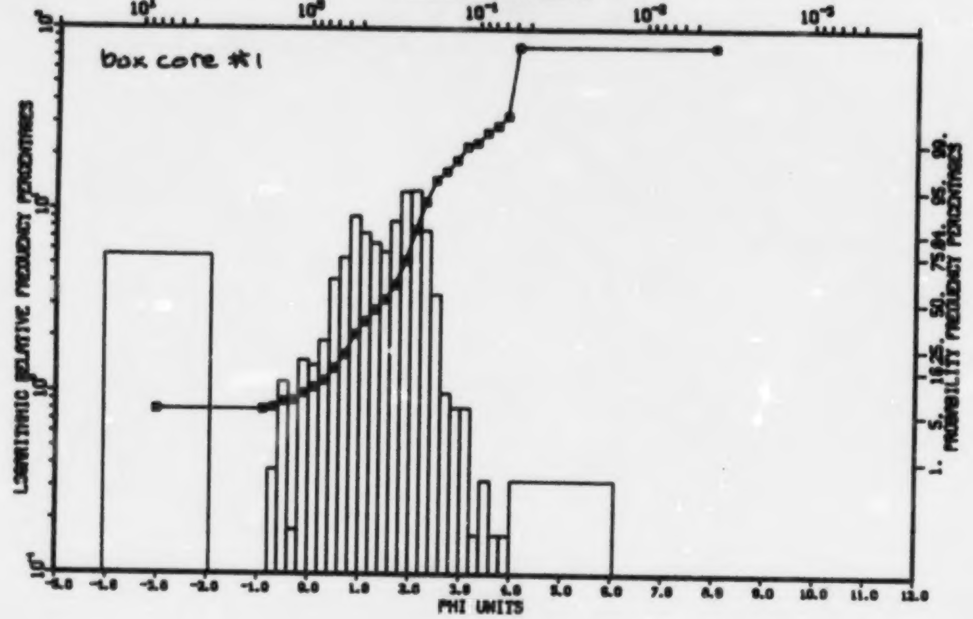


CAMBRIDGE=5 30-33 CM PEEL CORE 83-028
SAMPLE NUMBER- 2269
MILLIMETER EQUIVALENTS

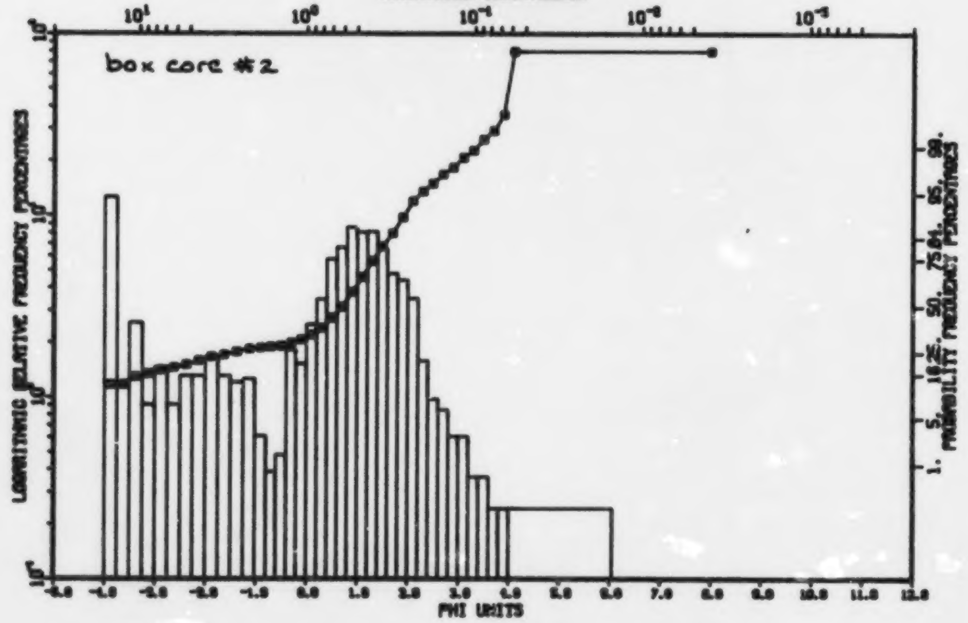


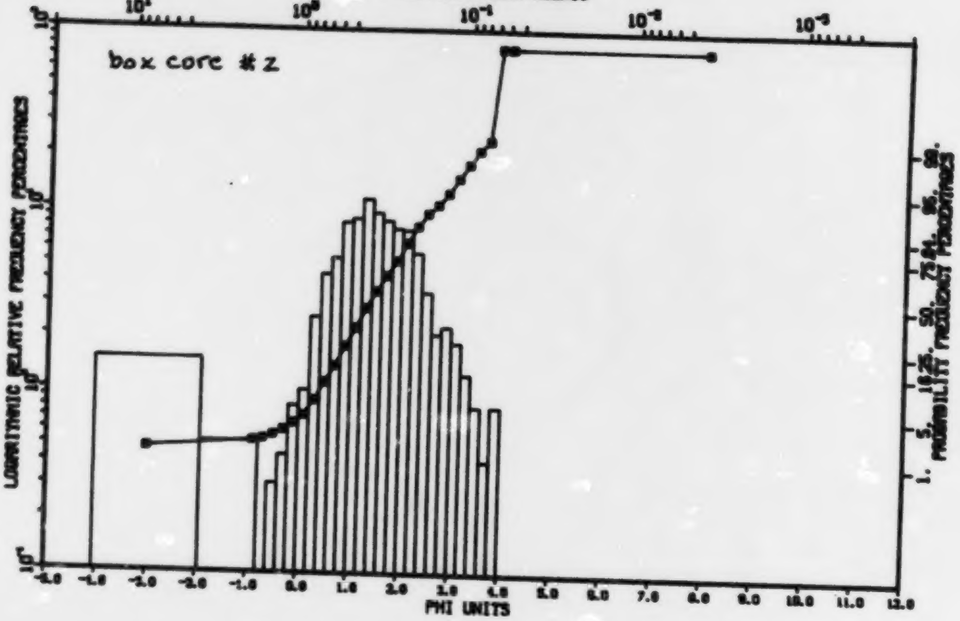
CAMBRIDGE=6 36-39 CM PEEL CORE 83-028
SAMPLE NUMBER- 2270
MILLIMETER EQUIVALENTS

CAMBRIDGE#7 30-35 CM PEEL CORE 83-028
SAMPLE NUMBER- 2271
MILLIMETER EQUIVALENTS



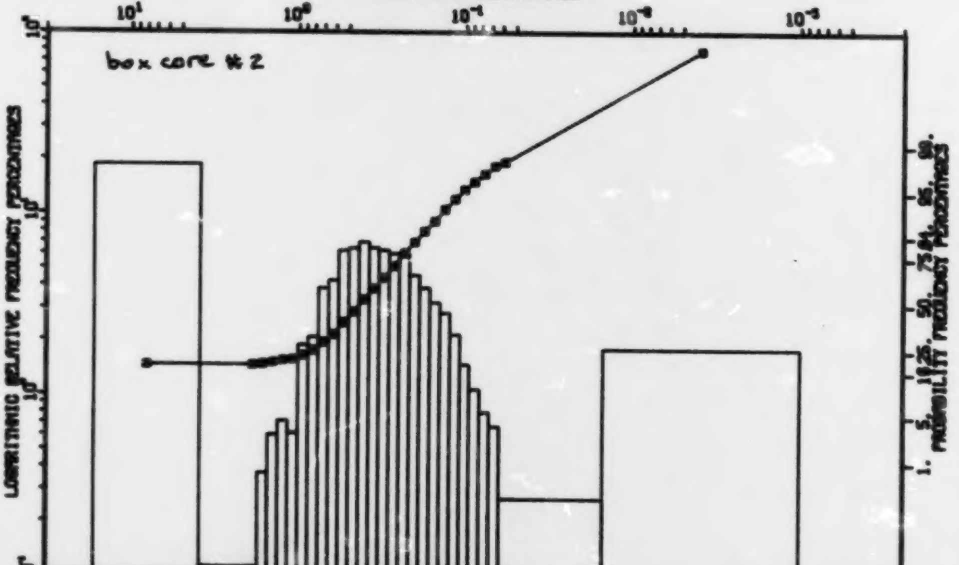
CAMBRIDGE KS #1 0-10 CM PEEL CORE 83-028
SAMPLE NUMBER- 2272
MILLIMETER EQUIVALENTS





CAMBRIDGE W3 #1 15 CM PEEL CORE 83-028
SAMPLE NUMBER- 2273
MILLIMETER EQUIVALENTS

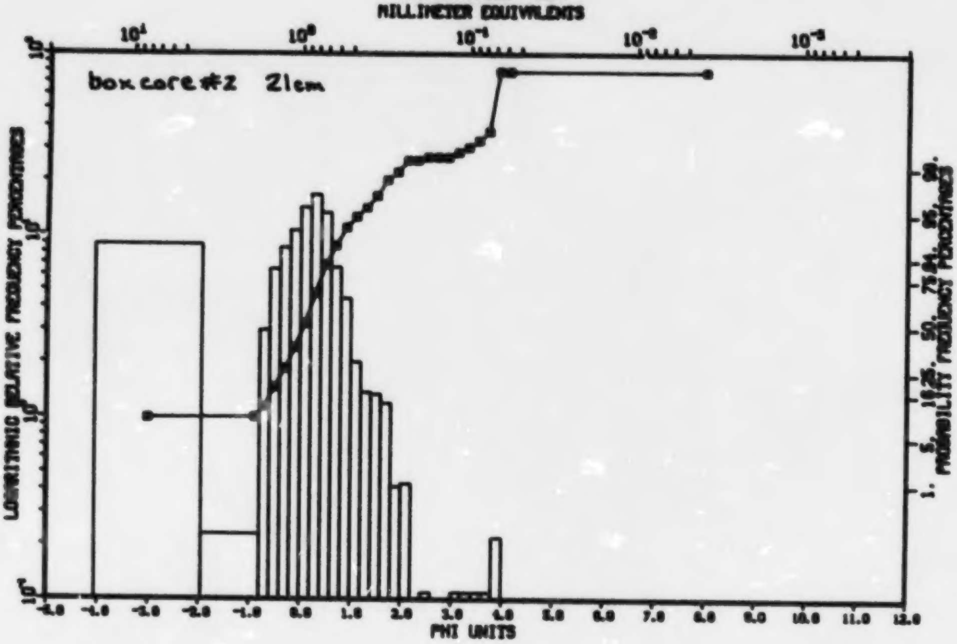
box core #2



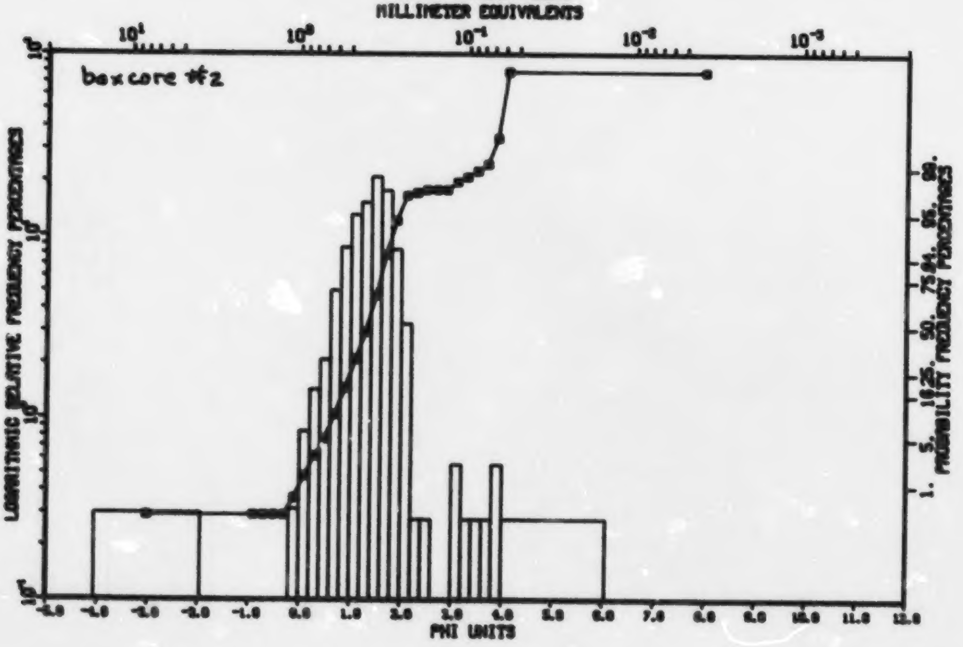
CAMBRIDGE W3 #1 20 CM PEEL CORE
SAMPLE NUMBER- 2274
MILLIMETER EQUIVALENTS

box core #2

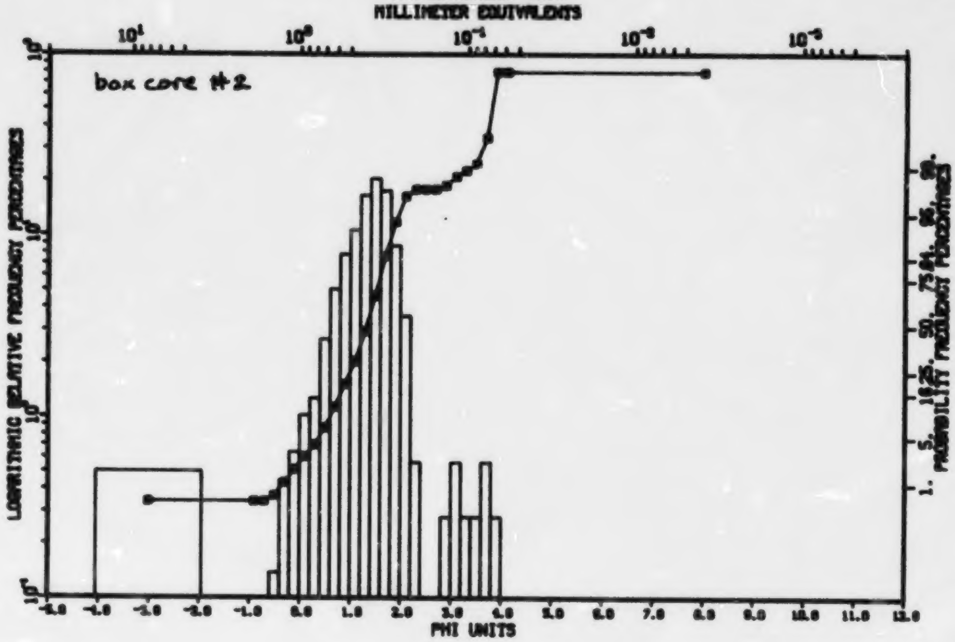
SAMPLE NUMBER- 2275



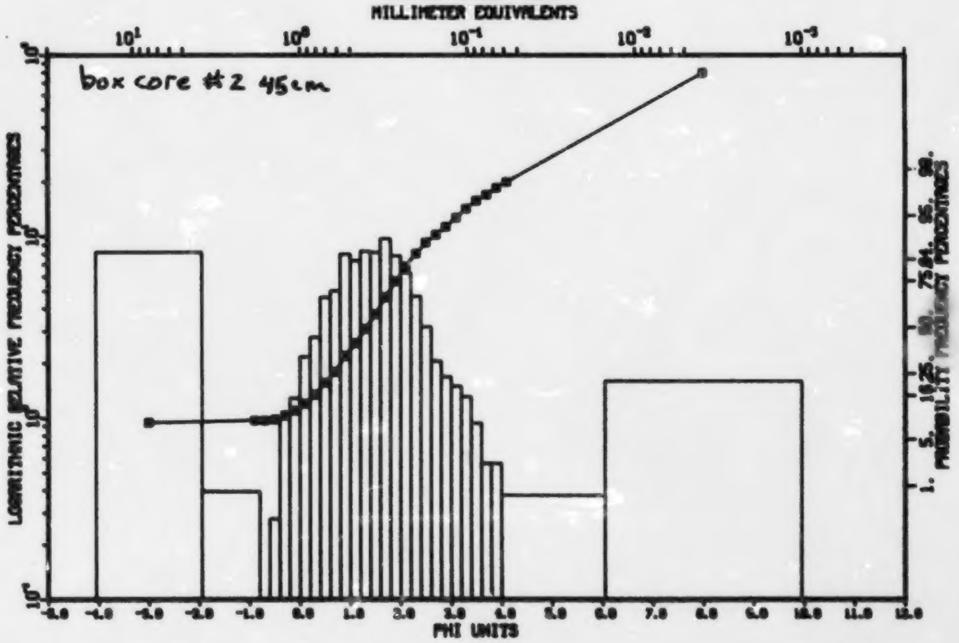
CAMBRIDGE WS #1 26 CM PEEL CORE 83-028
SAMPLE NUMBER- 2276

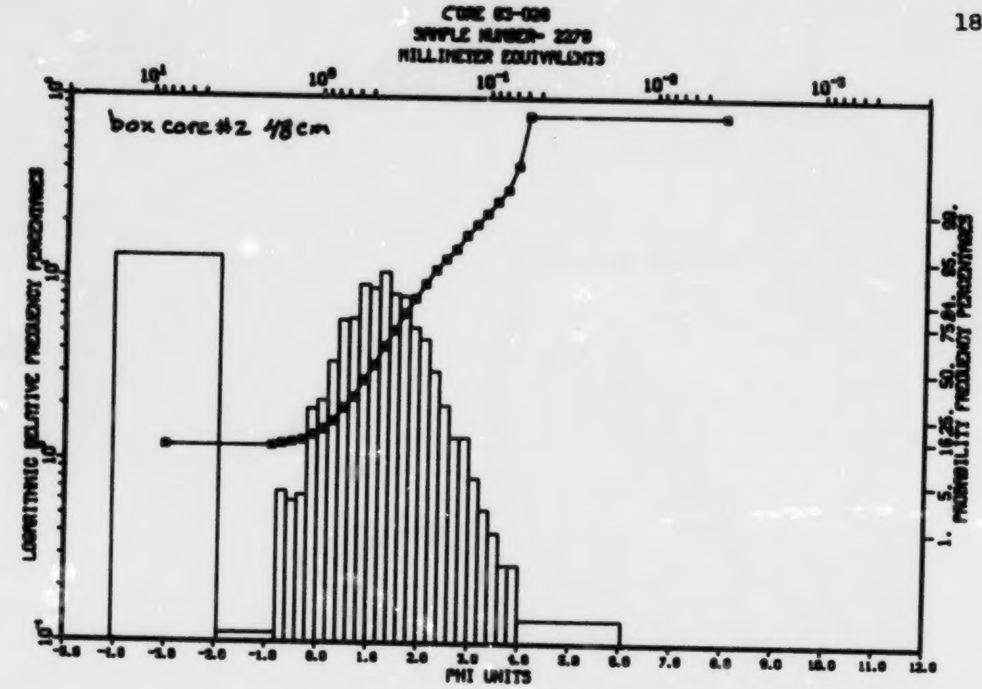


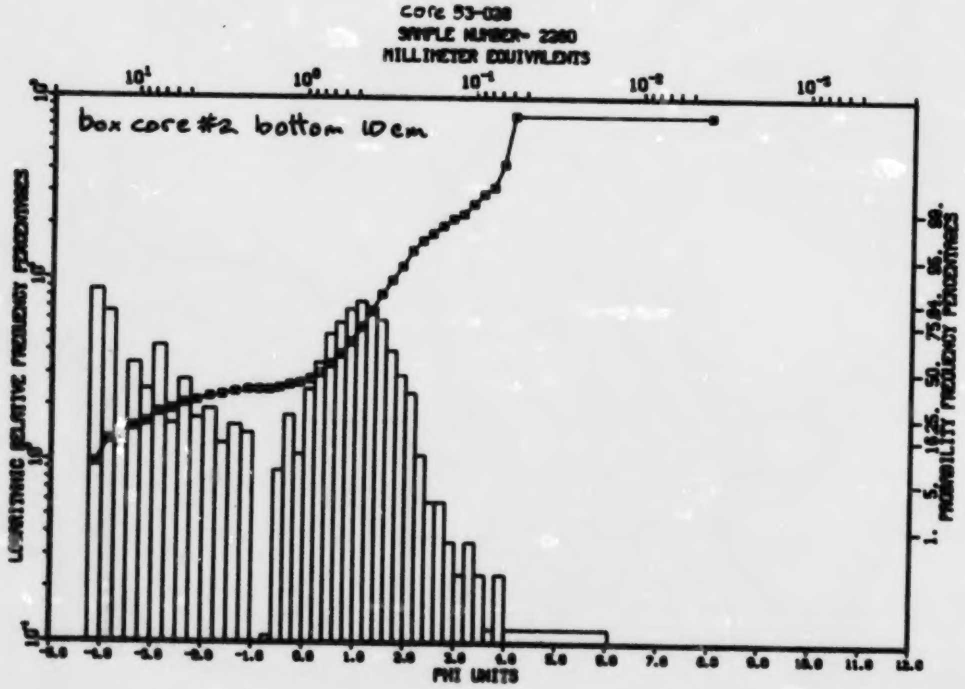
CAMBRIDGE W3=1 37.5 CM PEEL CORE 83-028
SAMPLE NUMBER- 2277



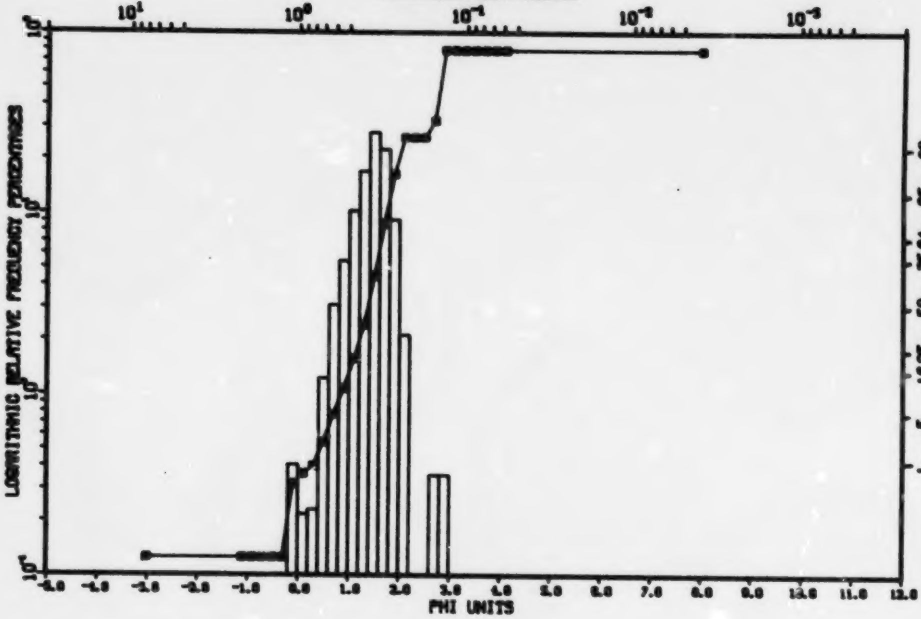
CORE 83-028
SAMPLE NUMBER- 2278



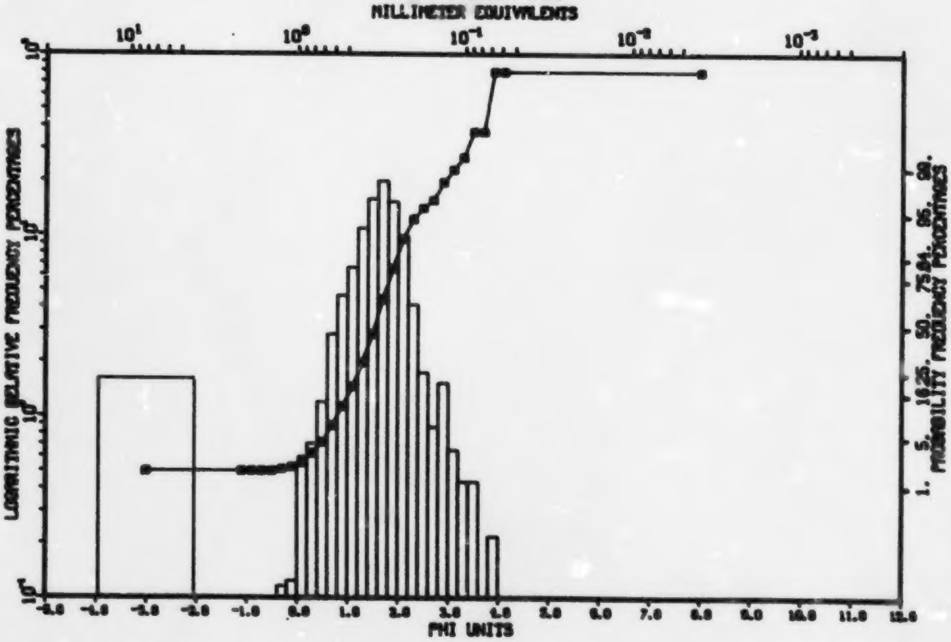

CORE 83-038
SAMPLE NUMBER- 2279
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
box core #2 48cm
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


core 53-038
SAMPLE NUMBER- 2280
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
box core #2 bottom 10cm
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

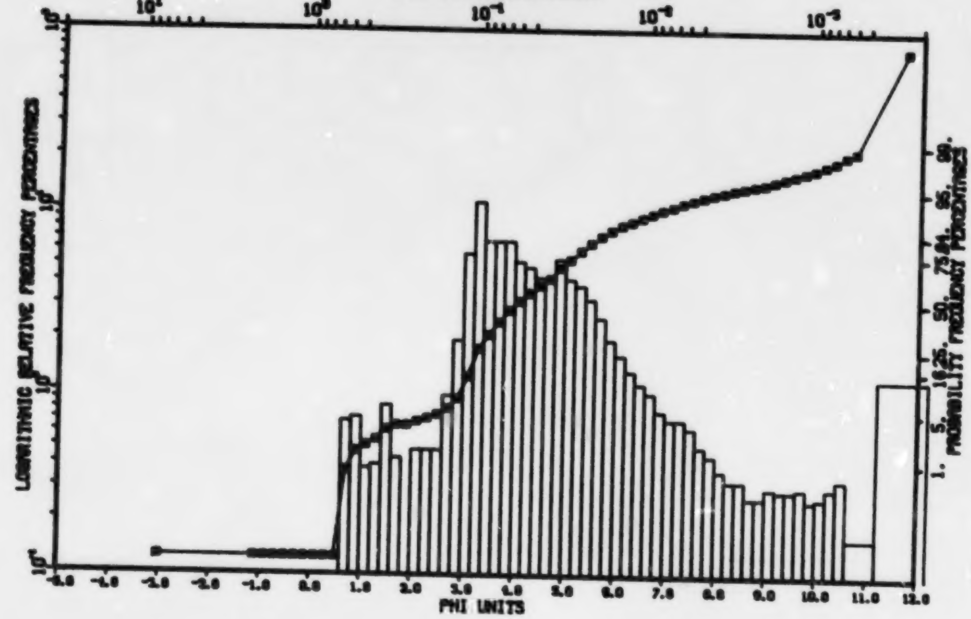
PECHAN BAY H.T.L.
SAMPLE NUMBER- 1380



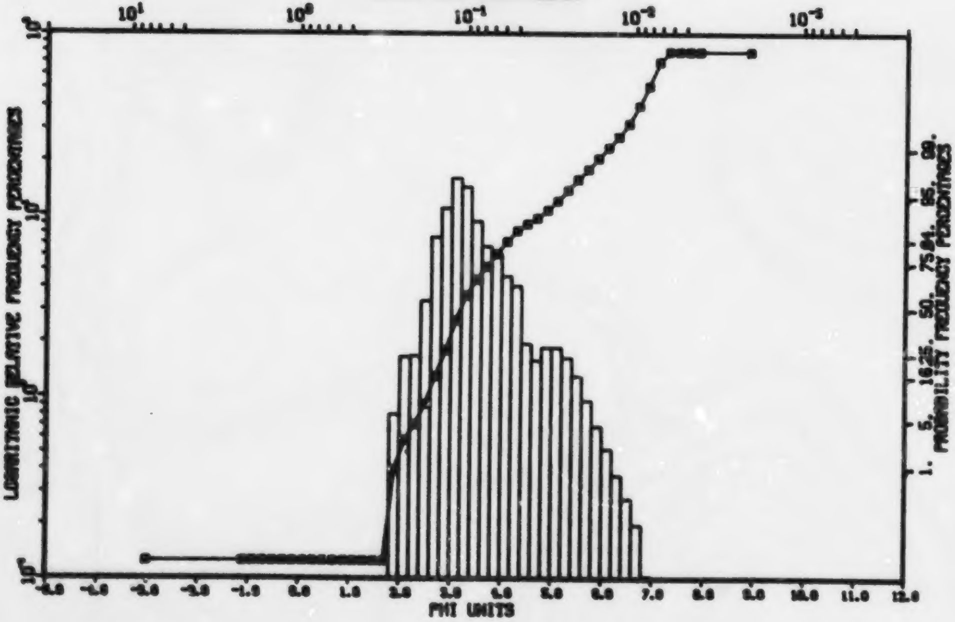
CAMBRIDGE FJORD # 1 BLACK SAND
SAMPLE NUMBER- 1381



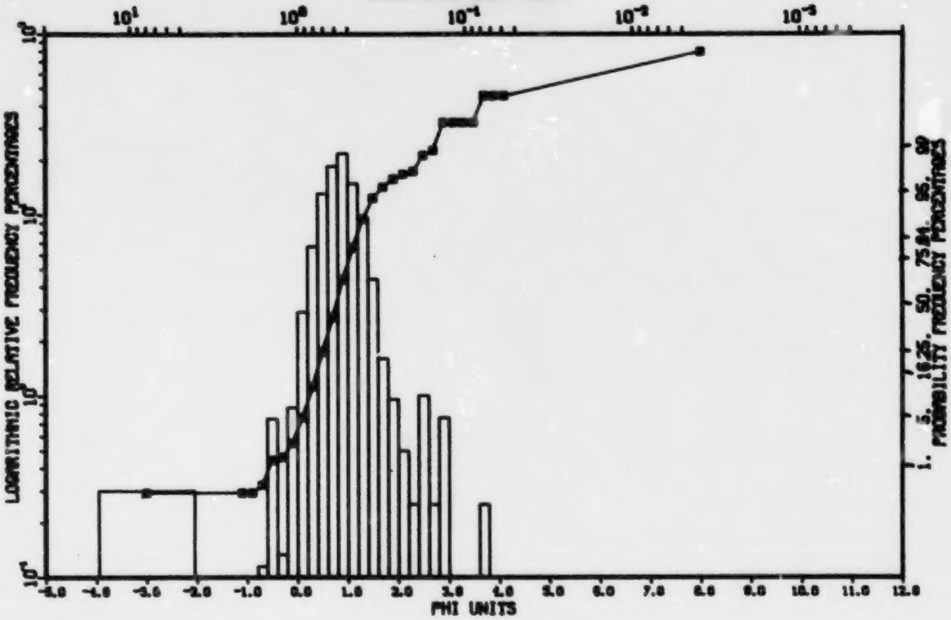
CAMBRIDGE FJORD PRODELTA BLACK SAND
SAMPLE 1382
MILLIMETER EQUIVALENTS



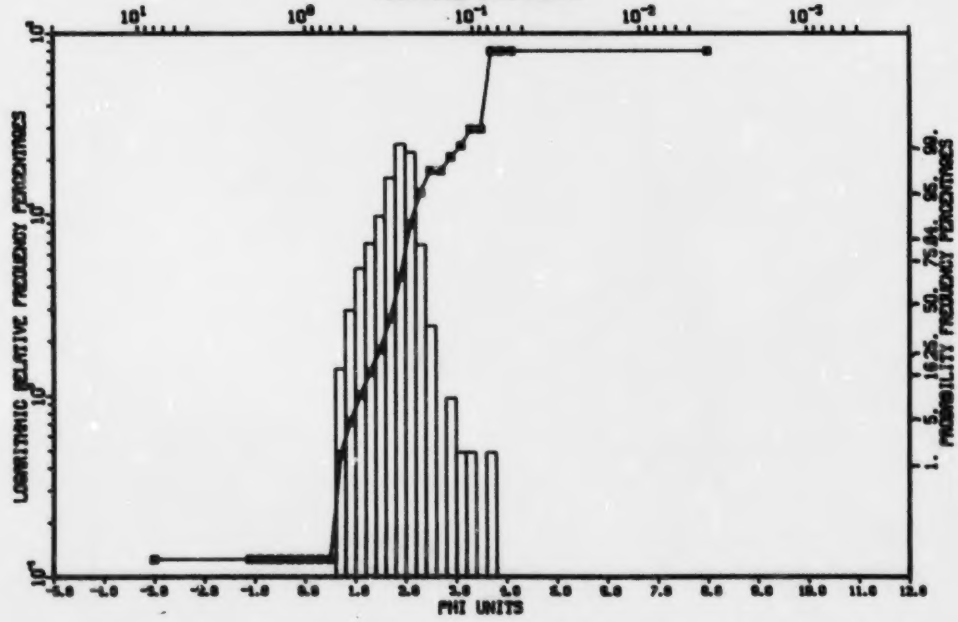
STEWART LAKE#1
SAMPLE 1383
MILLIMETER EQUIVALENTS



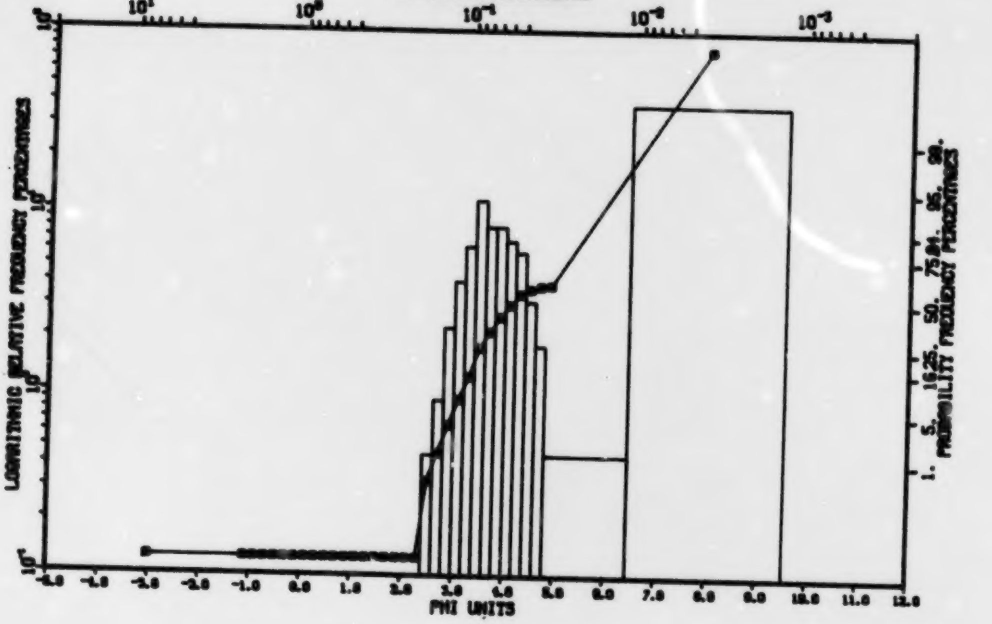
STEWART LAKE • 2
SAMPLE NUMBER- 1384



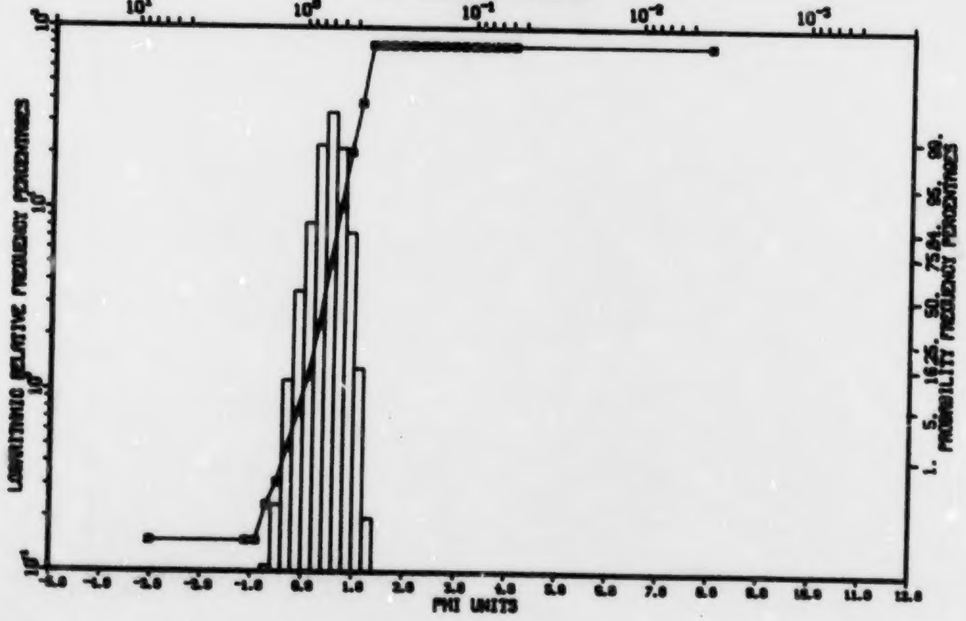
STEWART LAKE • 3
SAMPLE NUMBER- 1385



STEWART LAKE = 4
SAMPLE NUMBER- 1386
MILLIMETER EQUIVALENTS



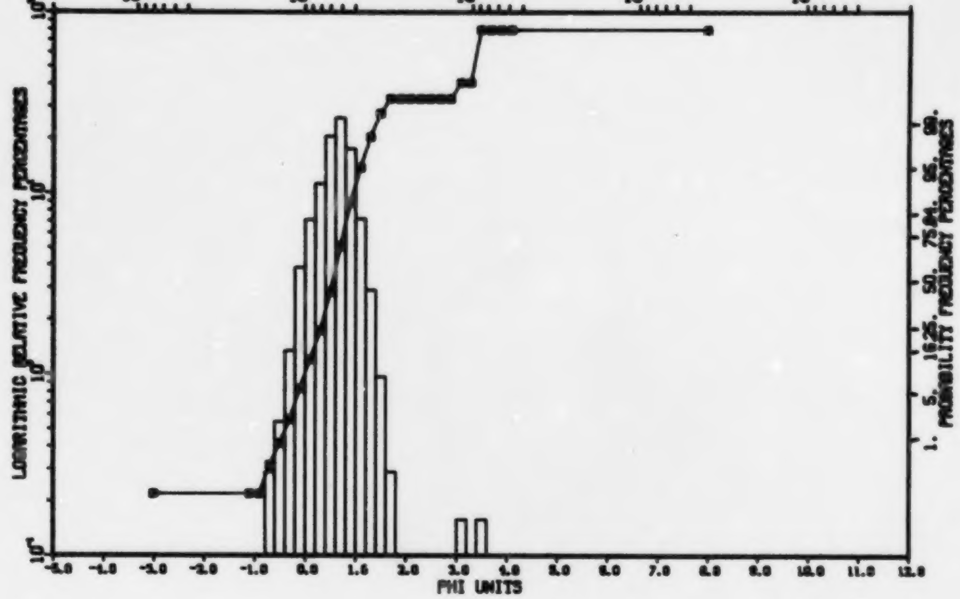
KOGALU RIVER = 1 MOUTH BAR
SAMPLE NUMBER- 1387
MILLIMETER EQUIVALENTS



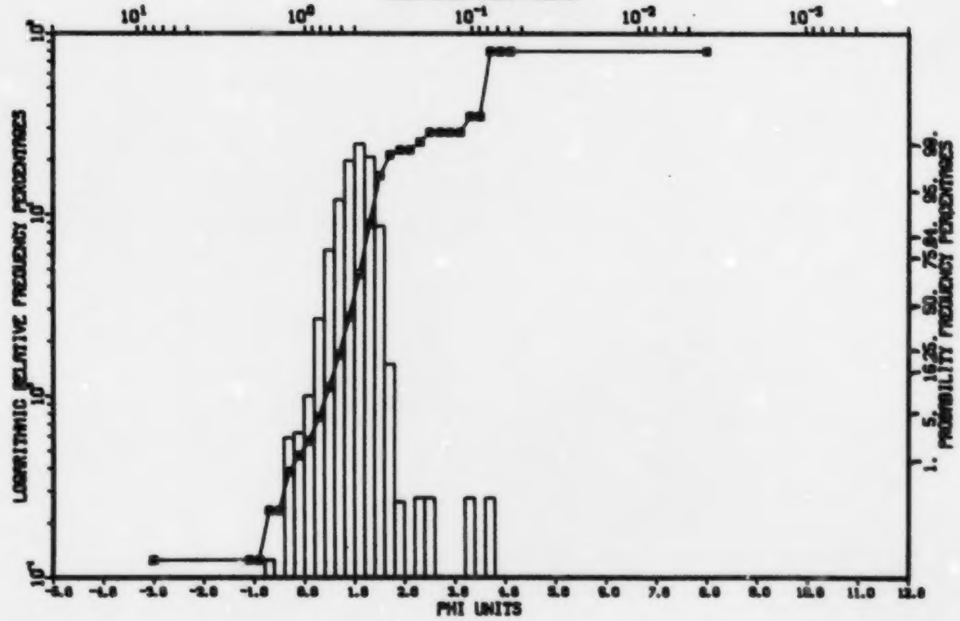
RIVER AND SEA
SAMPLE NUMBER- 1300
MILLIMETER EQUIVALENTS

KOGALU R. #2

crest of beach between

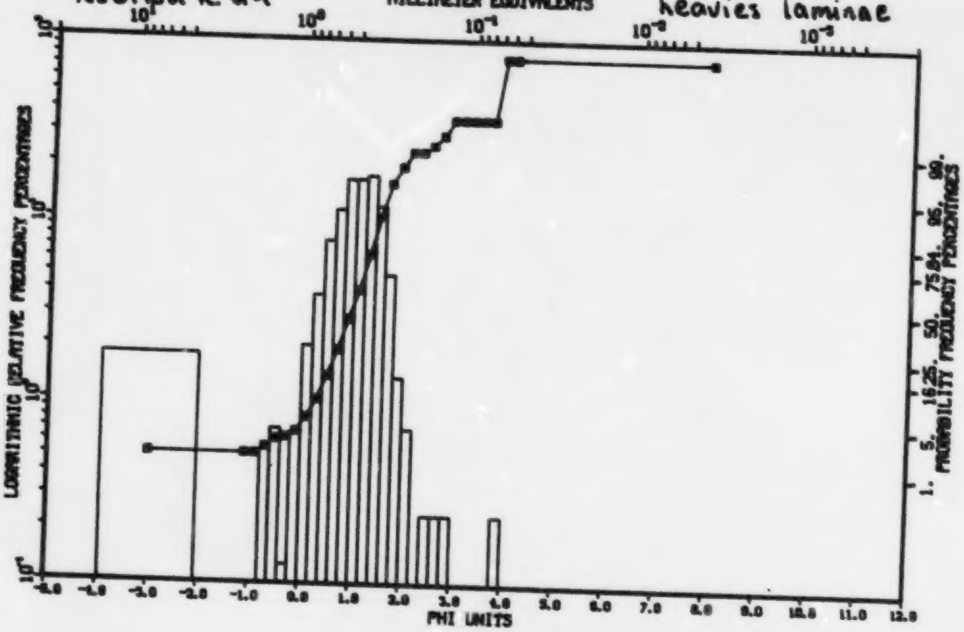


KOGALU RIVER # 3 1200 FEET FROM RIVER
SAMPLE NUMBER- 1300
MILLIMETER EQUIVALENTS



Trench #1

SAMPLE NUMBER- 1400

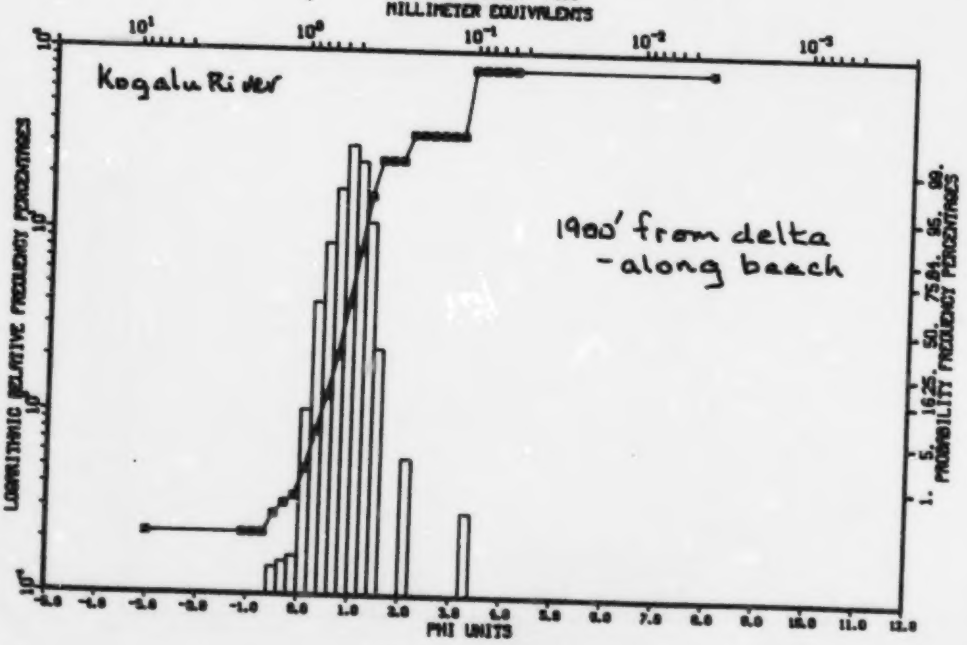


KOGALU R. #4

heavies laminae

BEACH SURFACE SAMPLE

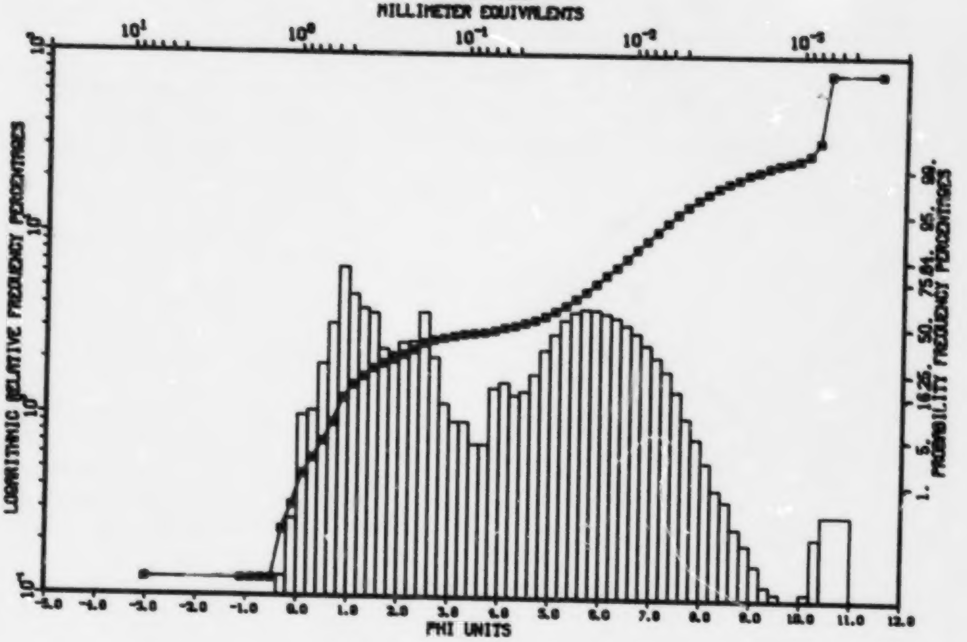
SAMPLE NUMBER- 1401



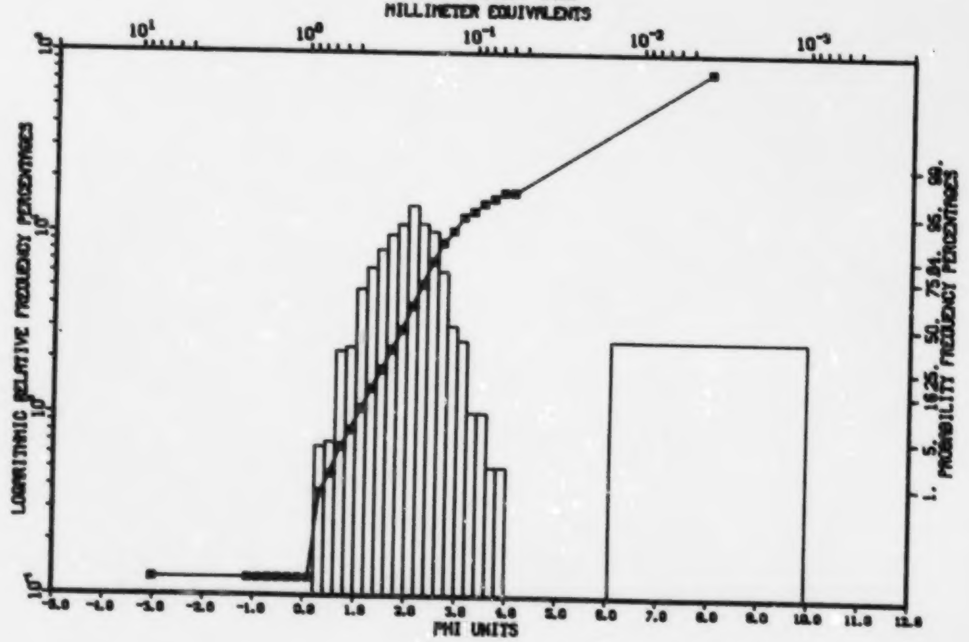
Kogalu River

1900' from delta
-along beach

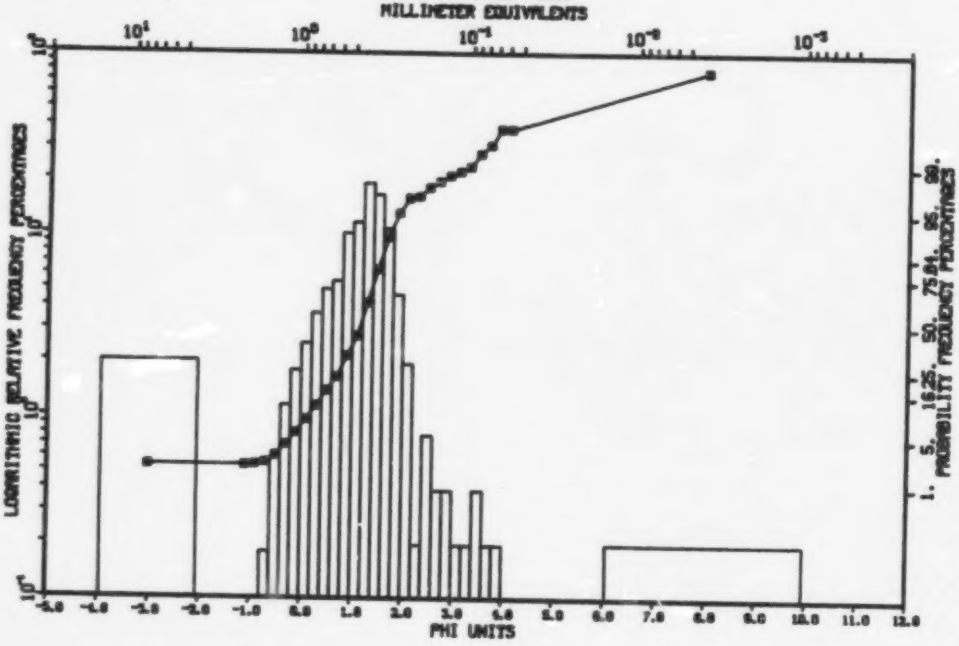
KOGALU RIVER=6 MUD FLOW FAN
SAMPLE 1402



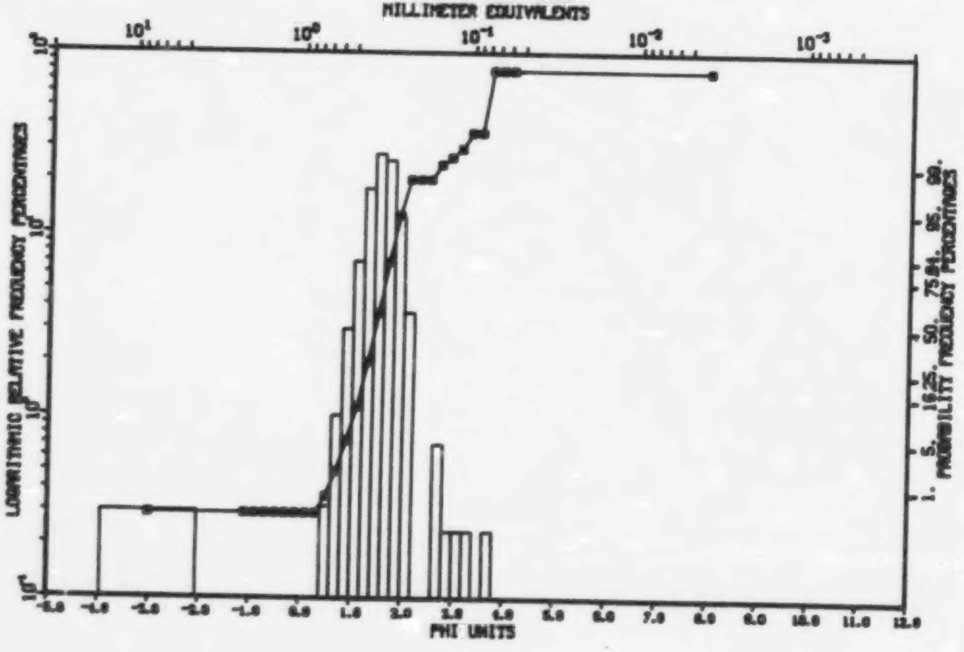
ITERBILUNG BOTTLE SAMPLE AEOLIAN
SAMPLE NUMBER- 1403



GUYS BIGHT # 1 RIVER BANK
SAMPLE NUMBER- 1380



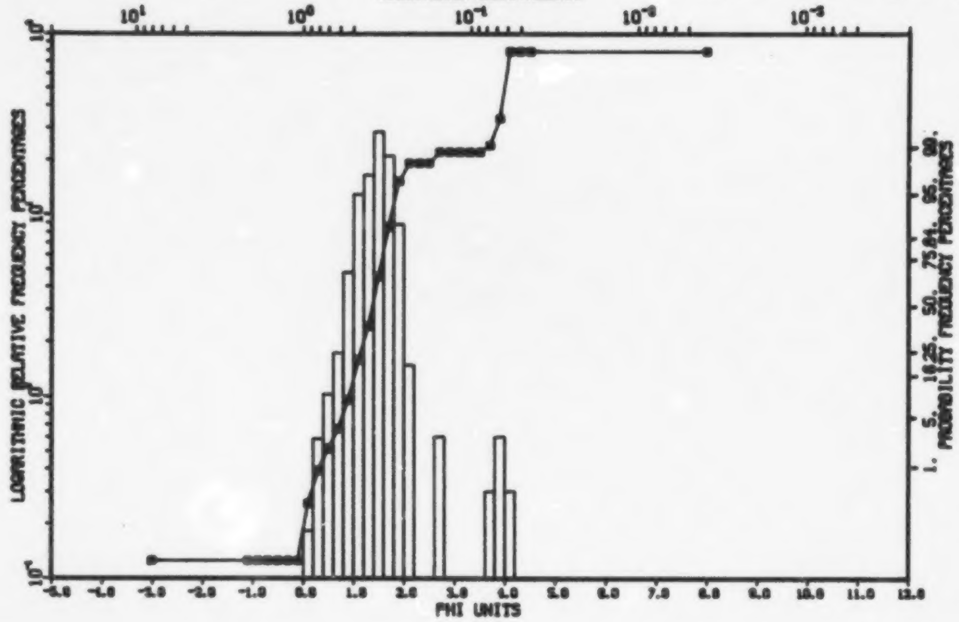
GUYS BIGHT # 2 BERMCREST
SAMPLE NUMBER- 1381



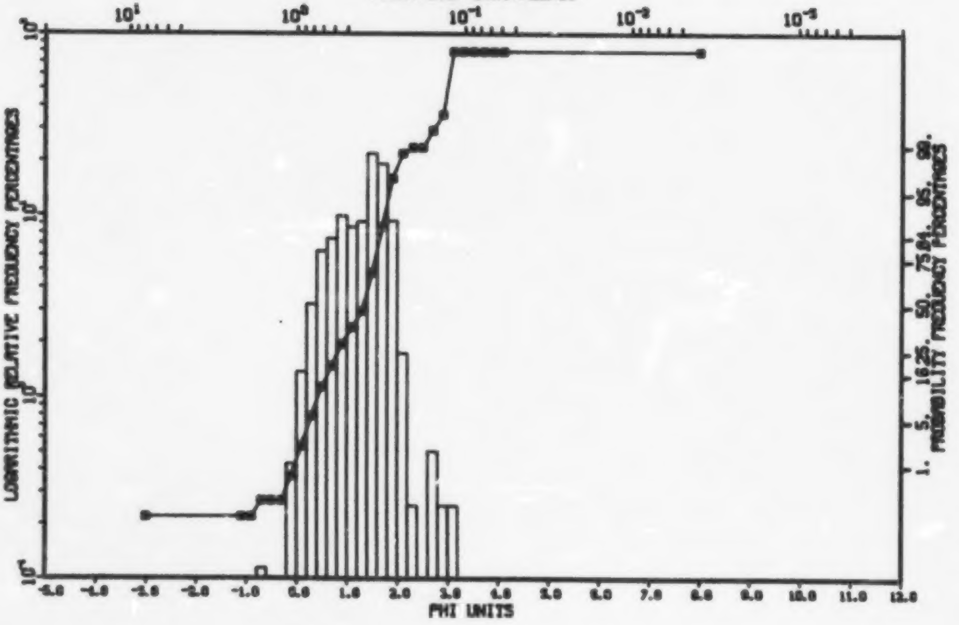
Guys Bight #3

SAMPLE NUMBER- 1362
MILLIMETER EQUIVALENTS

12cm below surface (Pit#1)



EGLINTON BEACH H.T.L.
SAMPLE NUMBER- 1363
MILLIMETER EQUIVALENTS



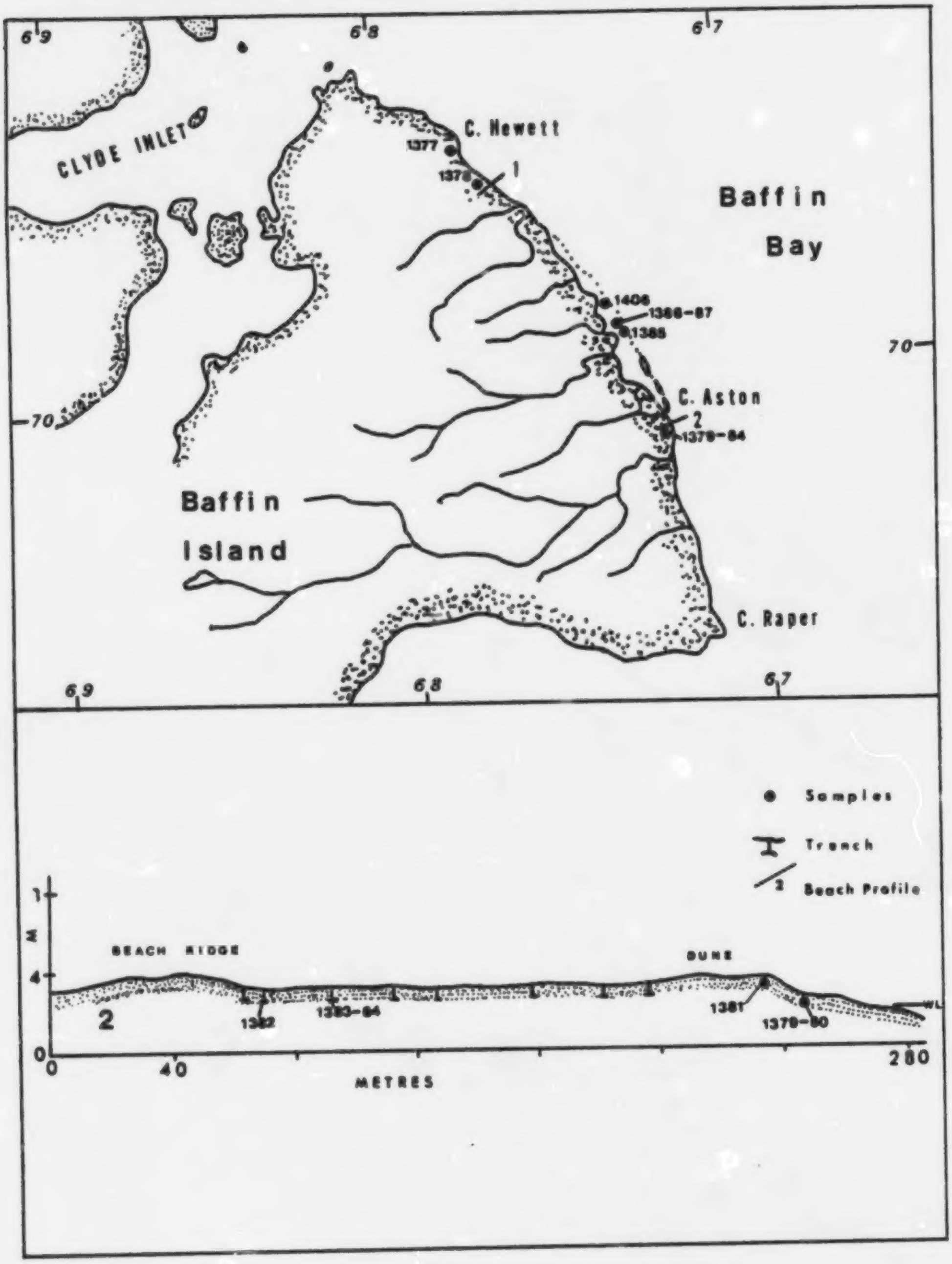
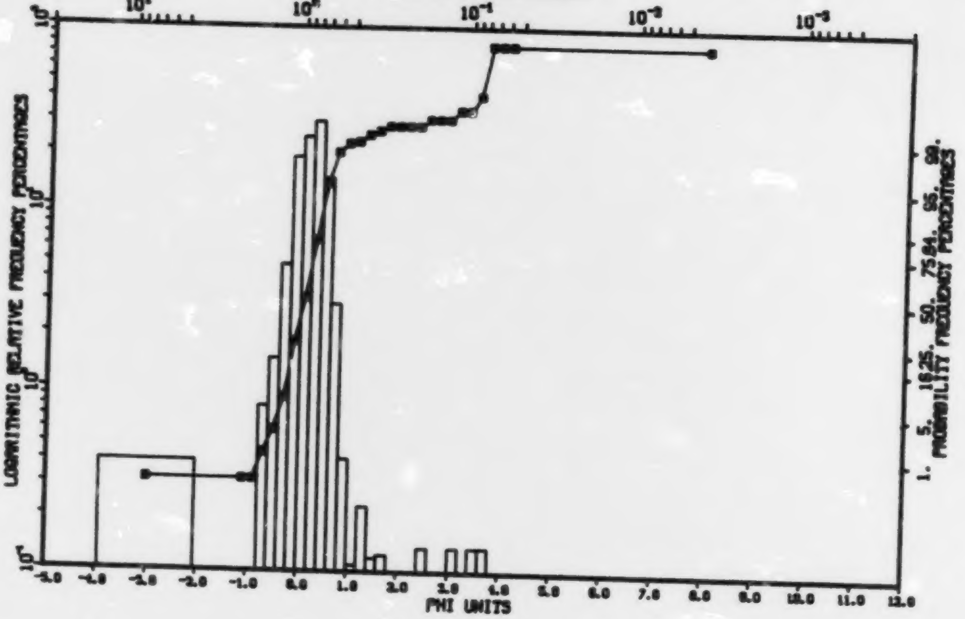
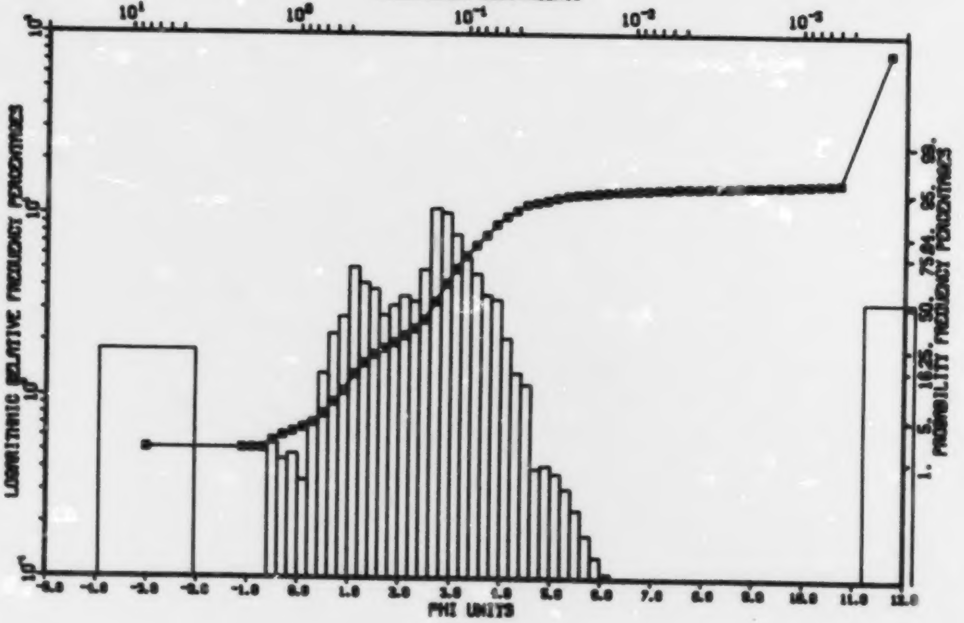

69
68
67
CLYDE INLET
C. Hewett
1377
1378
1
Baffin
Bay
1406
1386-87
1385
70
-70
C. Aston
2
1379-84
Baffin
Island
C. Raper
69
68
67
Samples
Trench
2
Beach Profile
1
M
4
0
BEACH RIDGE
DUNE
2
1382
1383-84
1381
1379-80
WL
0
40
280
METRES

Figure 18.24

CAPE ADAIR = 1 H.T.L. SURFACE
SAMPLE NUMBER- 1376
MILLIMETER EQUIVALENTS



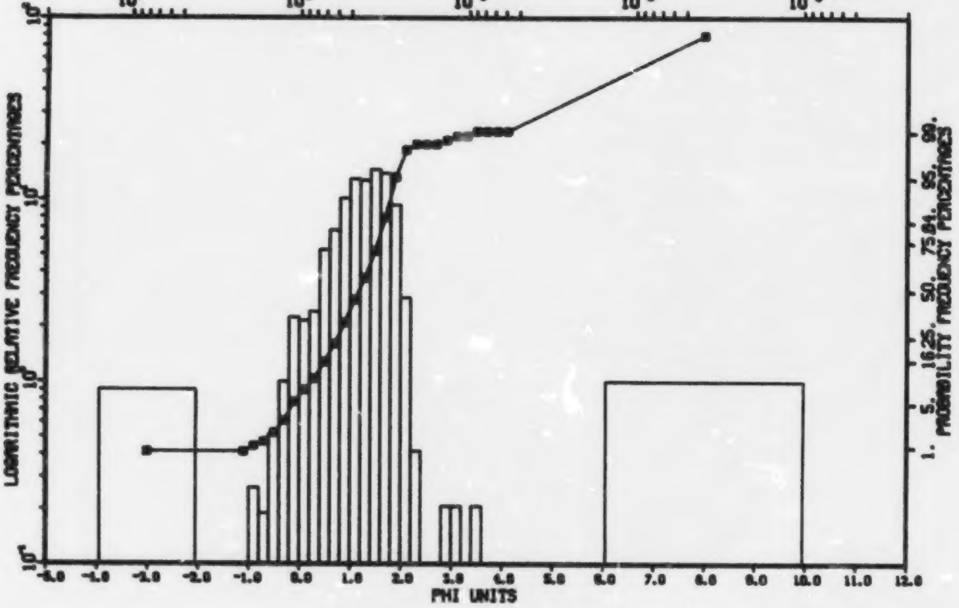
CAPE HEWITT=1 BLUFF=1
SAMPLE 1377
MILLIMETER EQUIVALENTS



Cape Hewitt #1

Sept. 13
SAMPLE NUMBER- 1378
MILLIMETER EQUIVALENTS

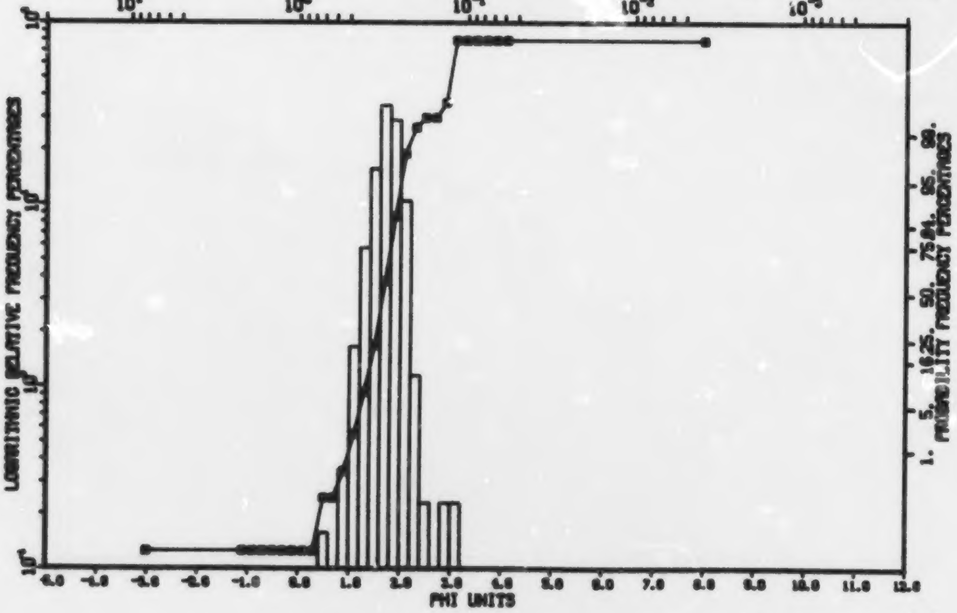
Old beach ridge



Cape Hewitt #2

TOP 15 CM
SAMPLE NUMBER- 1379
MILLIMETER EQUIVALENTS

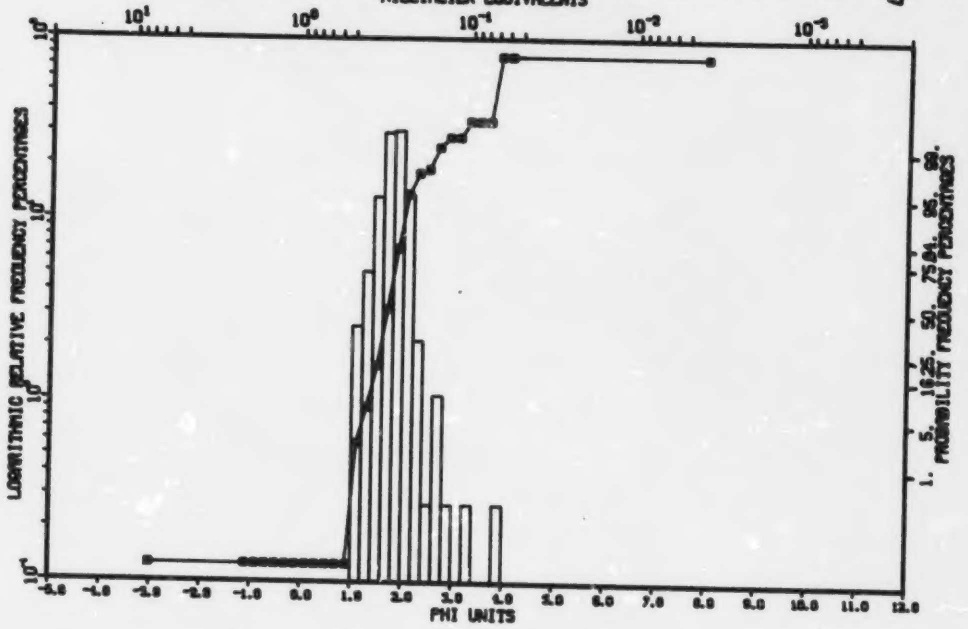
Brash ice zone - heavies



Cape Hewitt #2

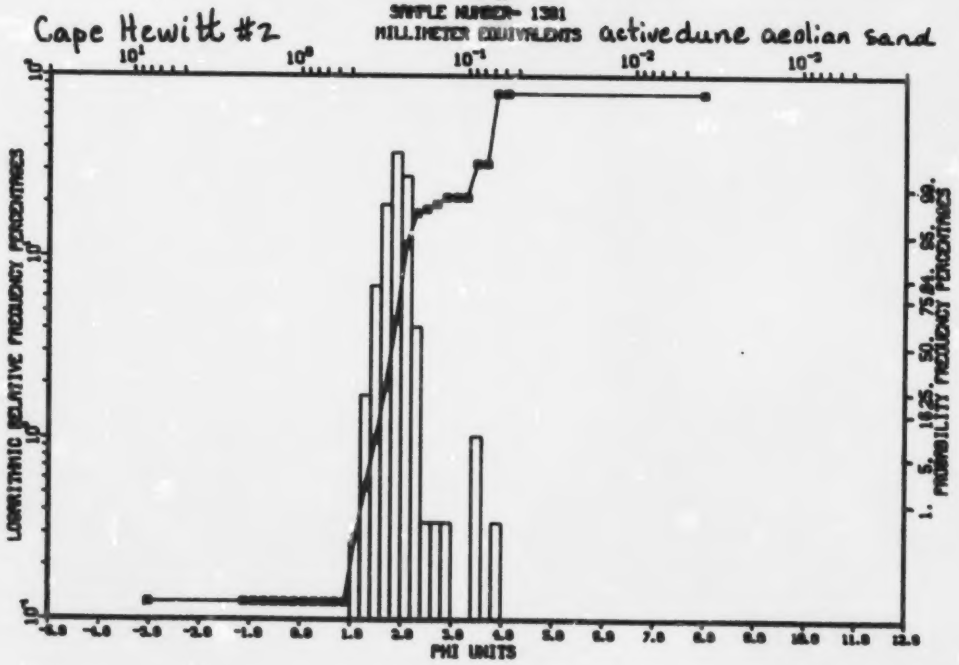
Subsurf. APPROX. 20 CM

Brash ice zone (lights)

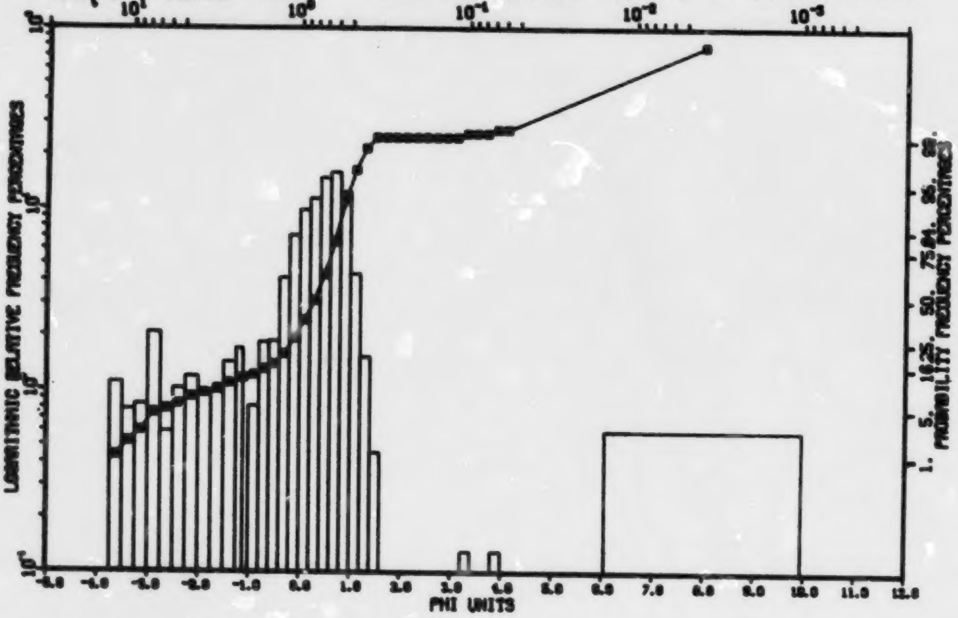


Cape Hewitt #2

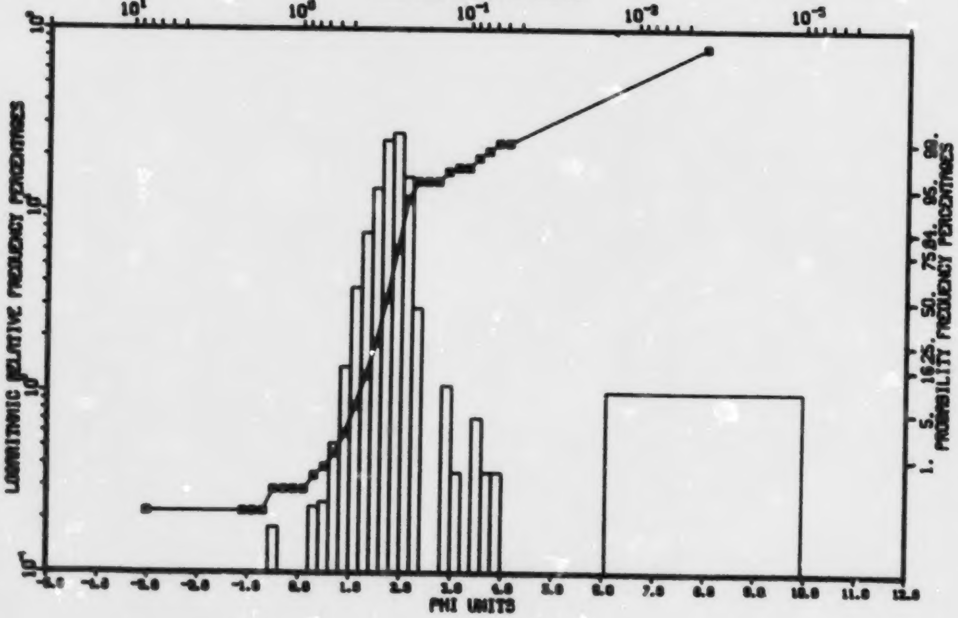
activedune aeolian sand

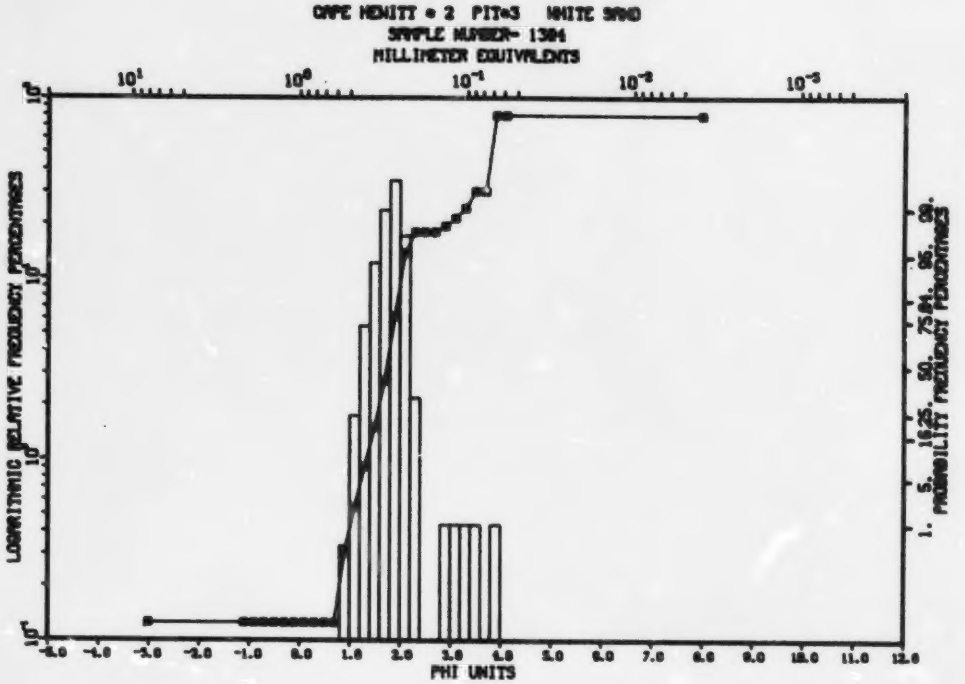


und ER,10 ON FINE MATERIAL
SAMPLE NUMBER- 1382
Cape Hewitt #2 MILLIMETER EQUIVALENTS Pit #2 coarser sand

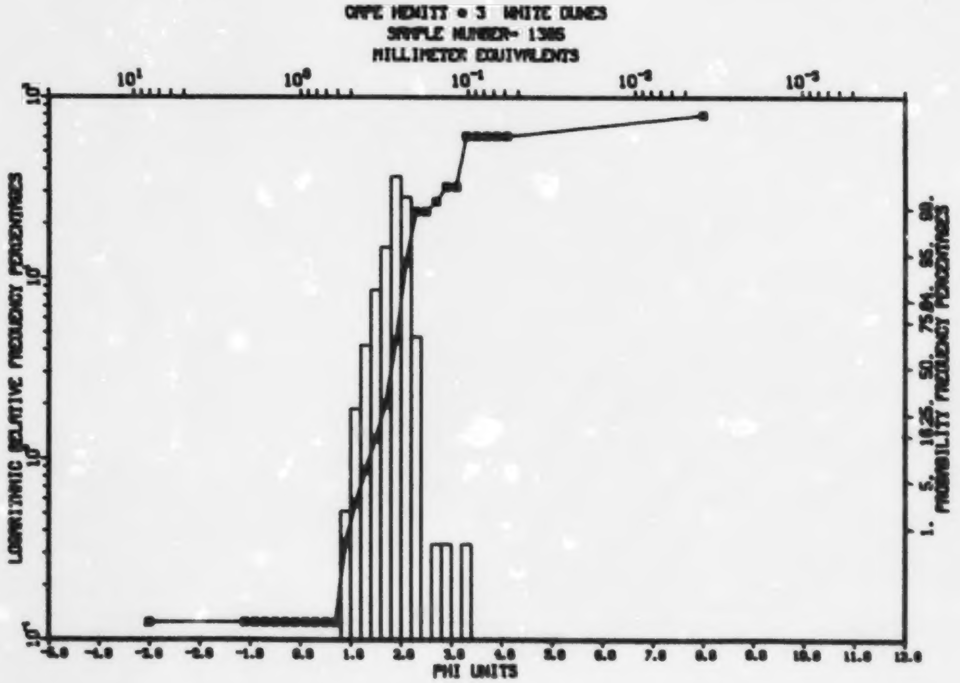


CAPE HEWITT # 2 PIT#3 BLACK SAND
SAMPLE NUMBER- 1383
MILLIMETER EQUIVALENTS



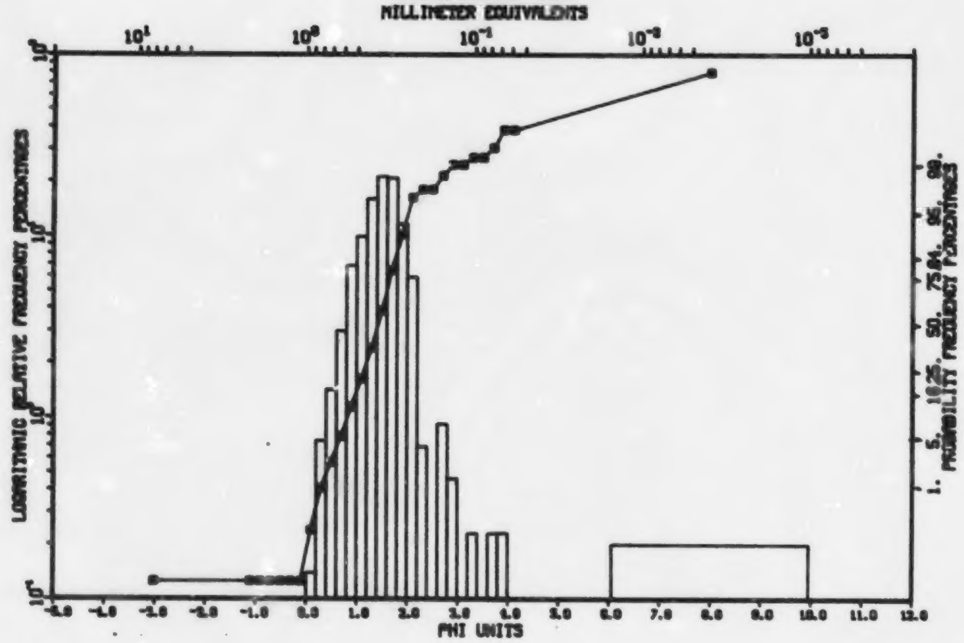


CAPE HEWITT # 2 PIT#3 WHITE SAND
SAMPLE NUMBER- 1304
MILLIMETER EQUIVALENTS

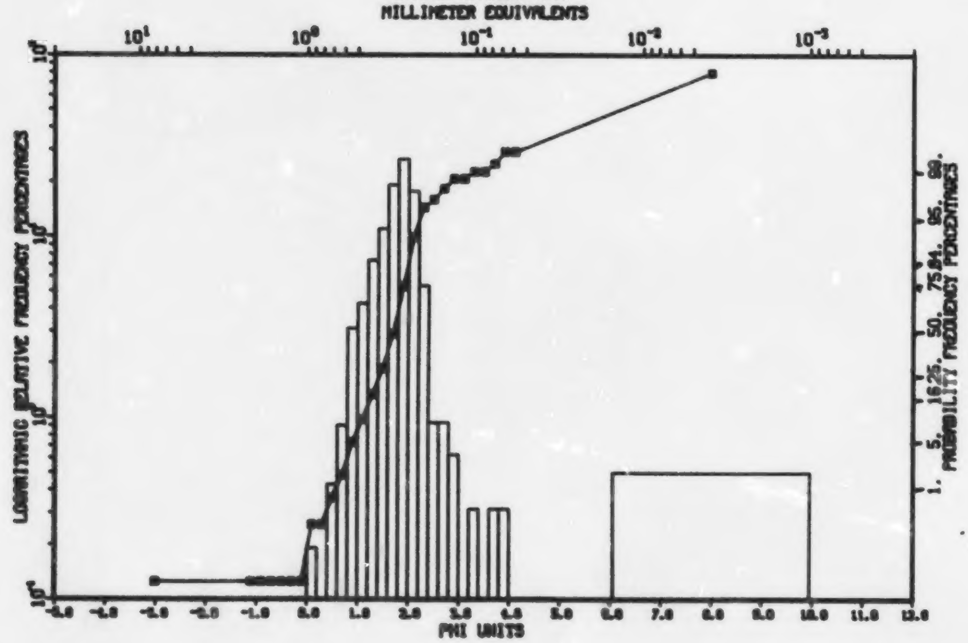


CAPE HEWITT # 3 WHITE DUNES
SAMPLE NUMBER- 1305
MILLIMETER EQUIVALENTS

CAPE HEWITT # 3 YELLOW DUNES
SAMPLE NUMBER- 1388



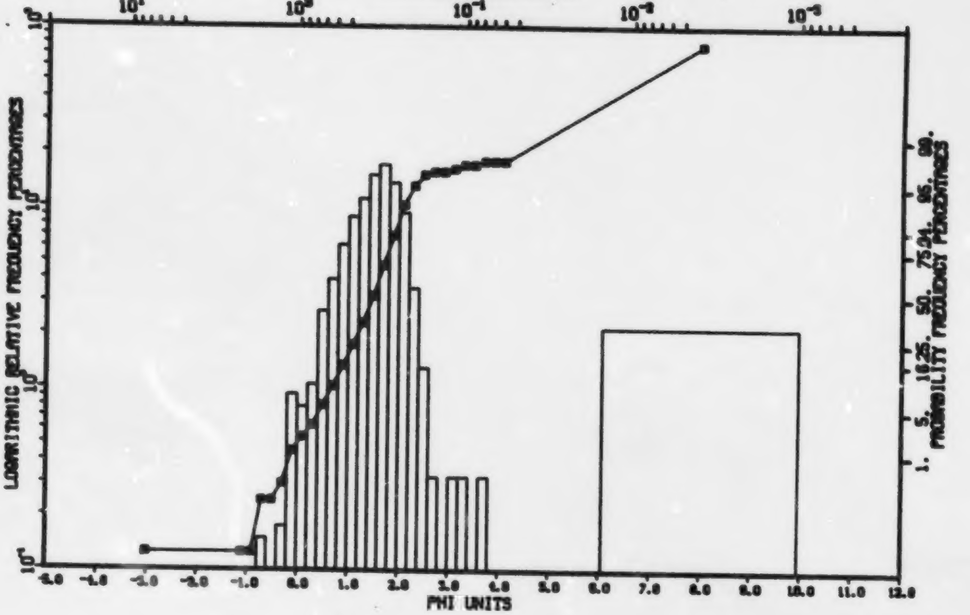
CAPE HEWITT # 4 UNDER YELLOW DUNES
SAMPLE NUMBER- 1387



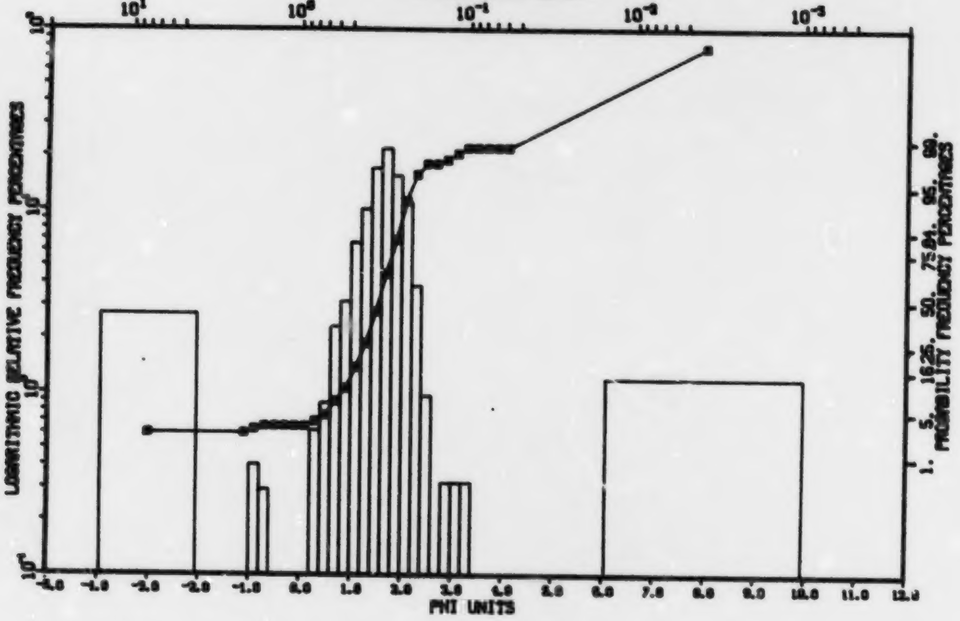
Cape Hewitt

ON OLD BEACH RIDGE
SAMPLE NUMBER- 1406
MILLIMETER EQUIVALENTS

lag deposit



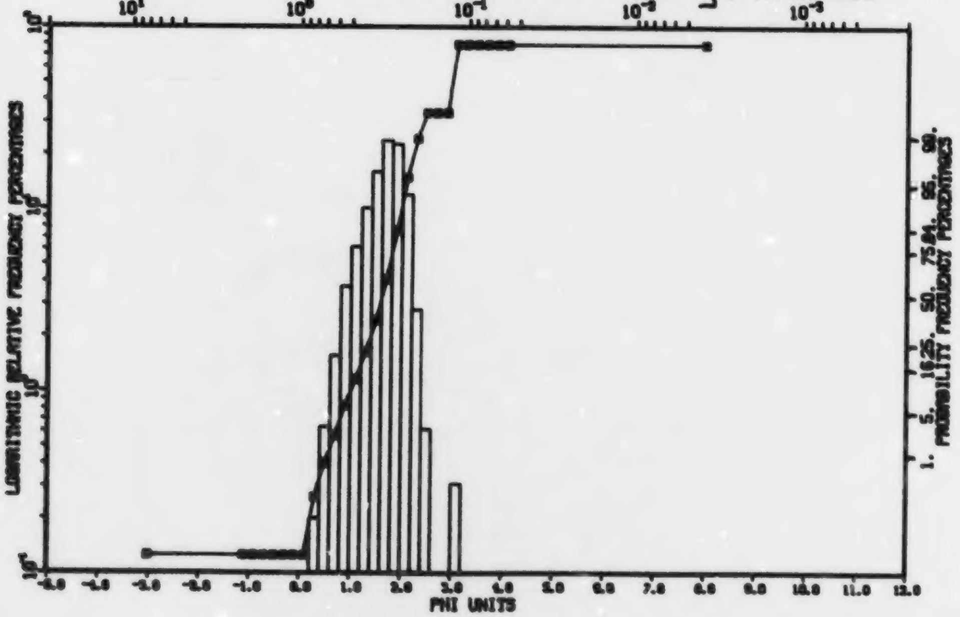
COUTTS INLET DELTA
SAMPLE NUMBER- 1404
MILLIMETER EQUIVALENTS



Sept. '83
SAMPLE NUMBER- 1405
MILLIMETER EQUIVALENTS

Pond Inlet

heavy minerals



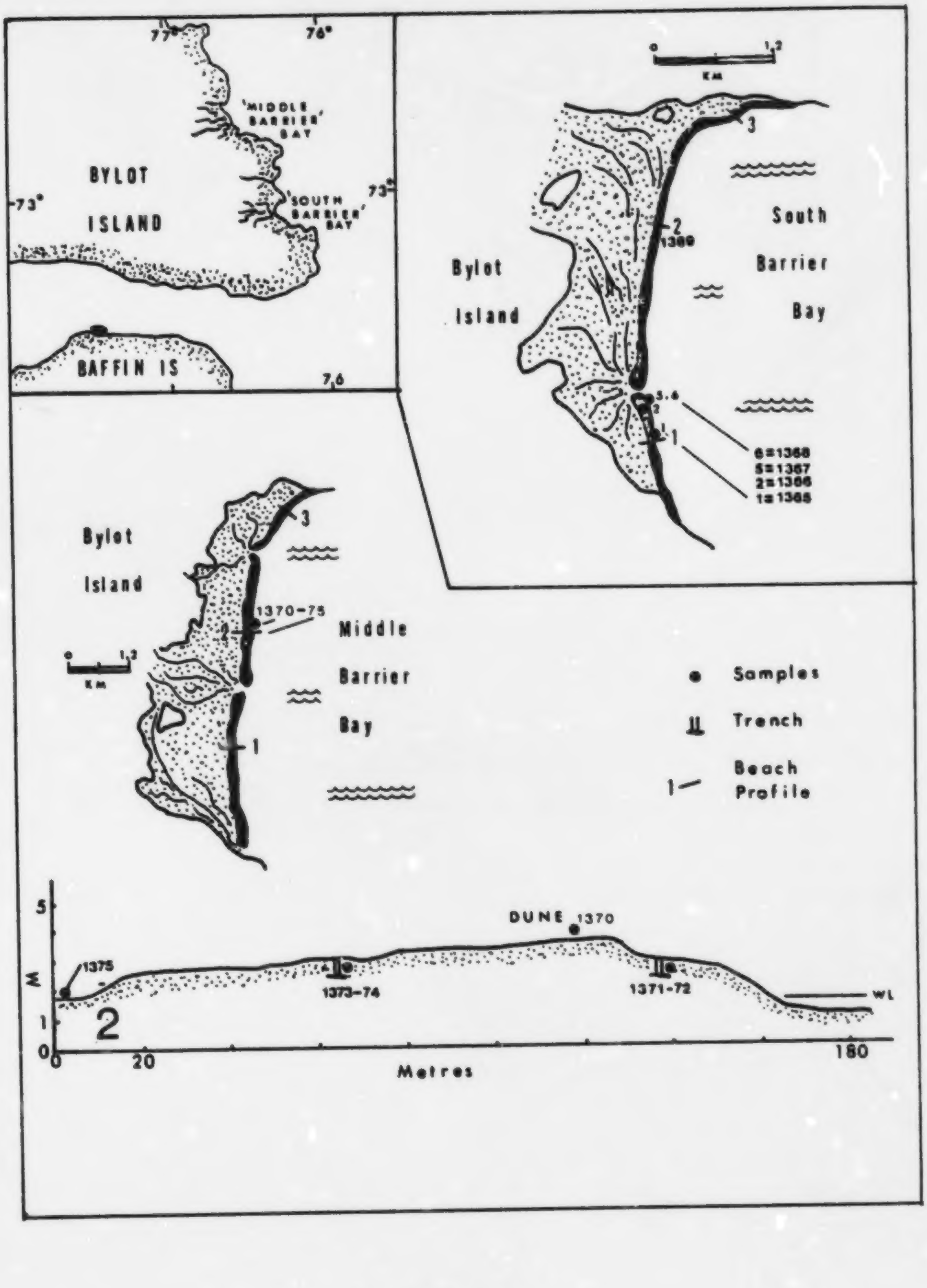
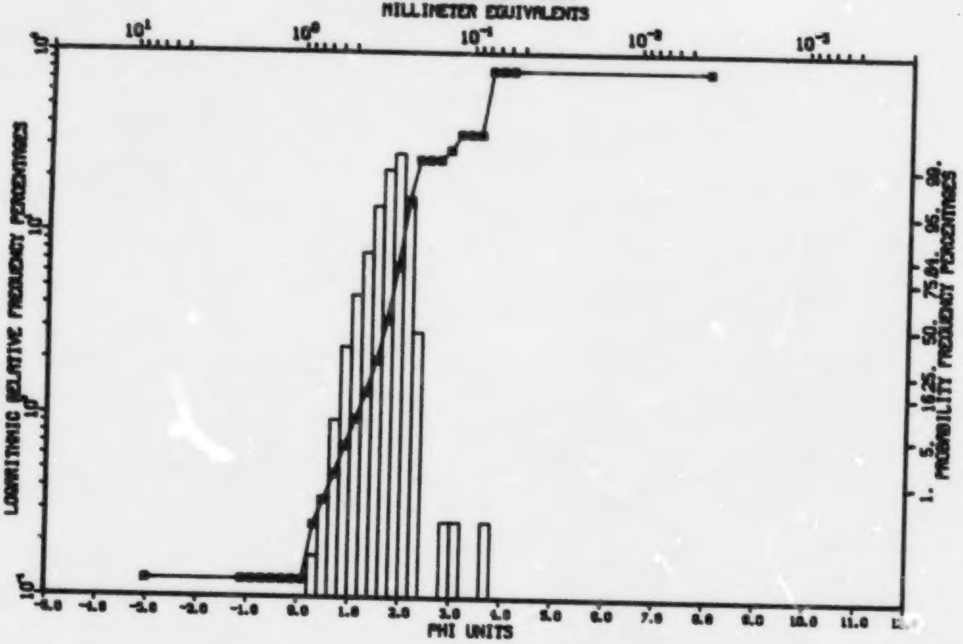

77°
76°
'MIDDLE BARRIER' BAY
BYLOT ISLAND
73°
73°
'SOUTH BARRIER' BAY
BAFFIN IS
76
0
1.2
KM
3
2
1369
South Barrier Bay
Bylot Island
5.6
2
1
1
6=1368
5=1367
2=1366
1=1365
Bylot Island
3
1370-75
2
Middle Barrier Bay
0
1.2
KM
1
Samples
Trench
Beach Profile
1
5
M
1
0
1375
DUNE 1370
1373-74
1371-72
WL
2
0
20
180
Metres

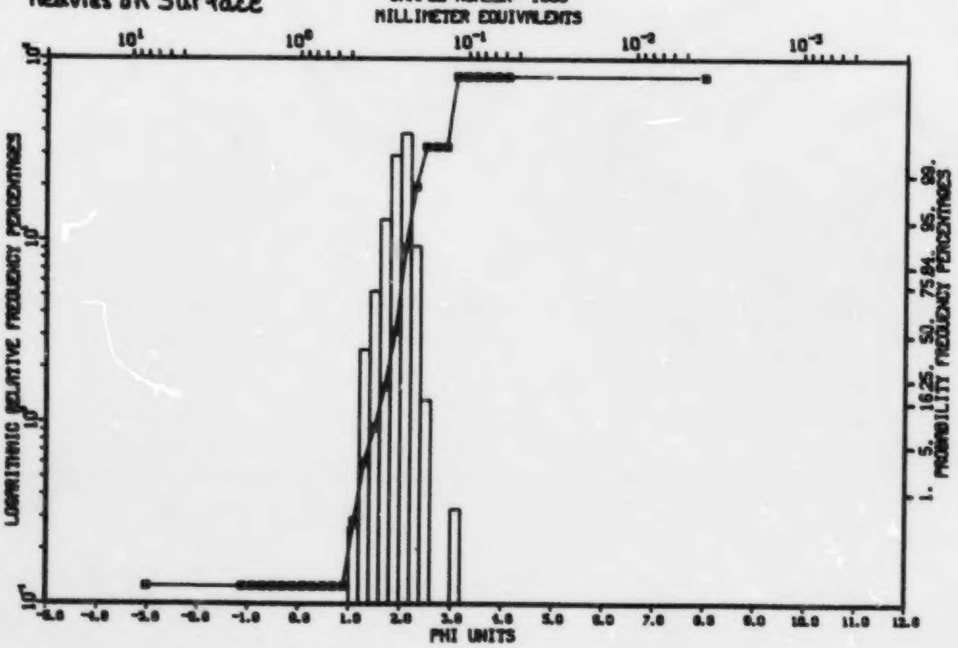
Figure 18.25

SCOTT ISLAND = 1 SEPT. 14
SAMPLE NUMBER- 1384



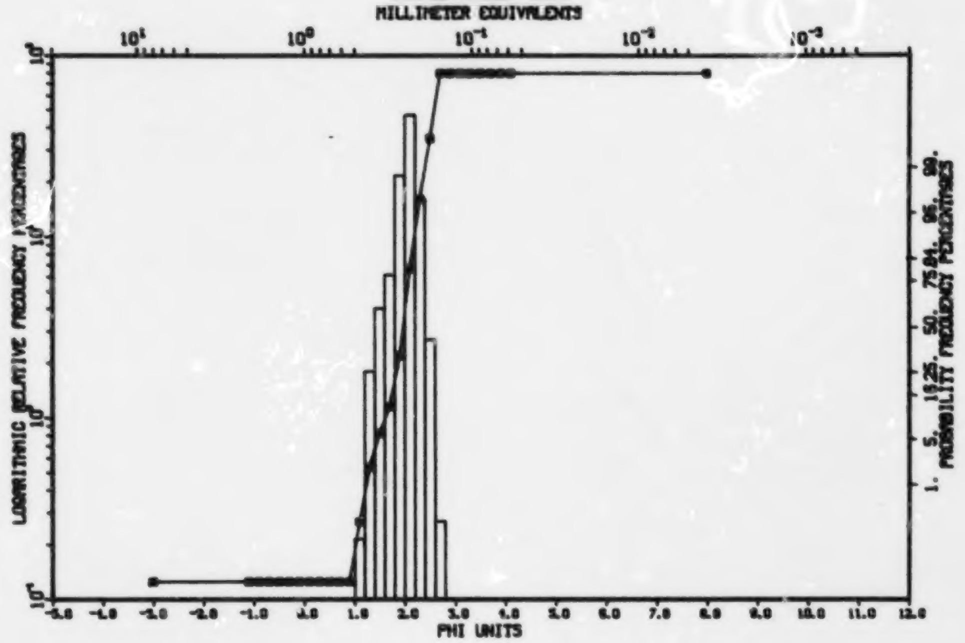
South Barrier #1
heavies on Surface

NEAR GRAVEL BANK
SAMPLE NUMBER- 1385



SOUTH BARRIER # 1 BERM(SAMPLE #2)

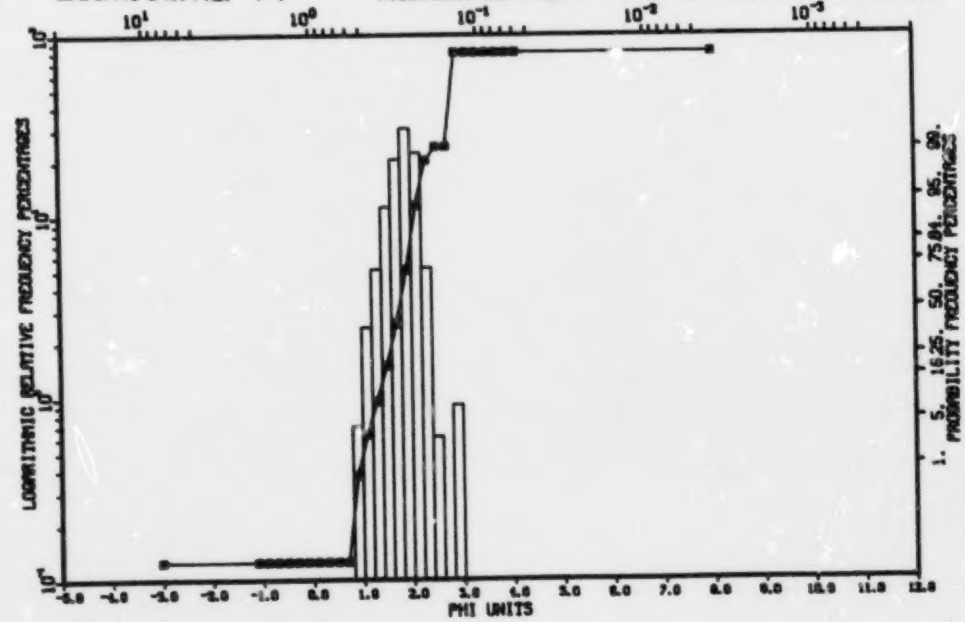
SAMPLE NUMBER- 1366



DUNE (#5)

SAMPLE NUMBER- 1367

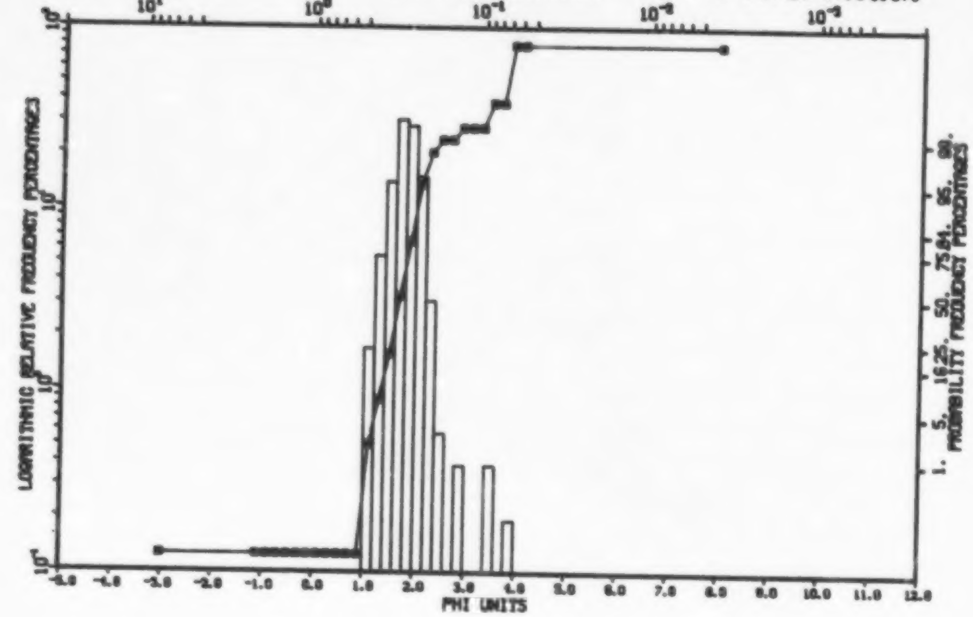
South Barrier #1 Geolian 10cm above Dune



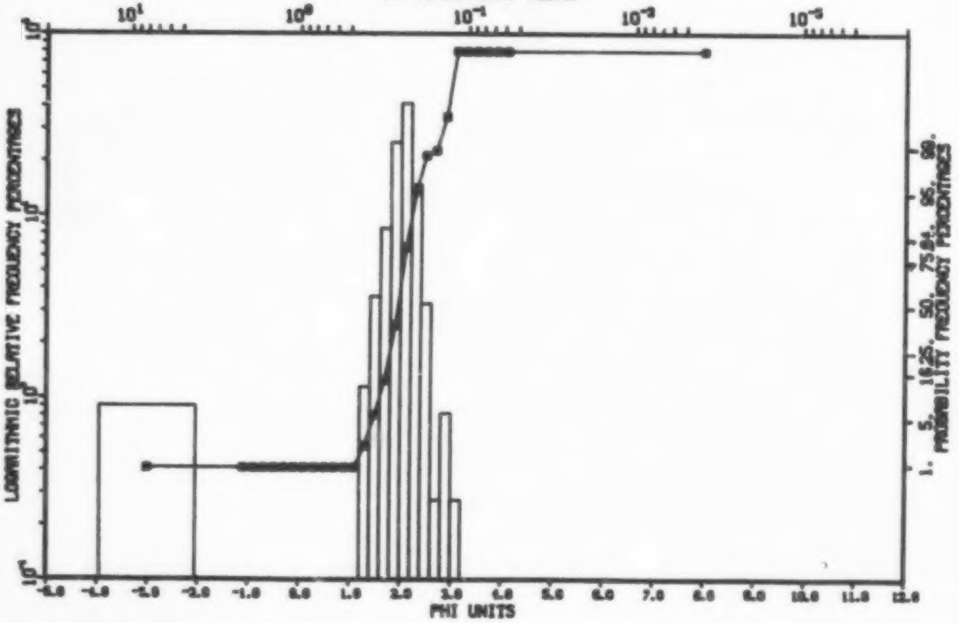
South Barrier #1

(=6)
SAMPLE NUMBER- 1388
MILLIMETER EQUIVALENTS

Close to river mouth



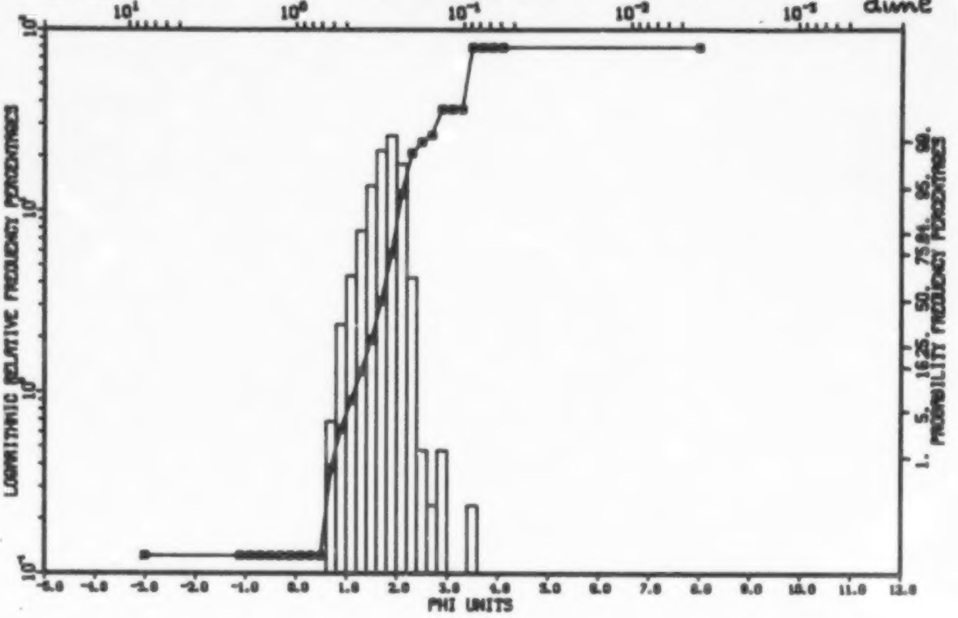
SOUTH BARRIER = 2 BEACH SAND (=1)
SAMPLE NUMBER- 1389
MILLIMETER EQUIVALENTS



DUNE 10 CM INTEGRATION
SAMPLE NUMBER- 1370

Middle Barrier #2

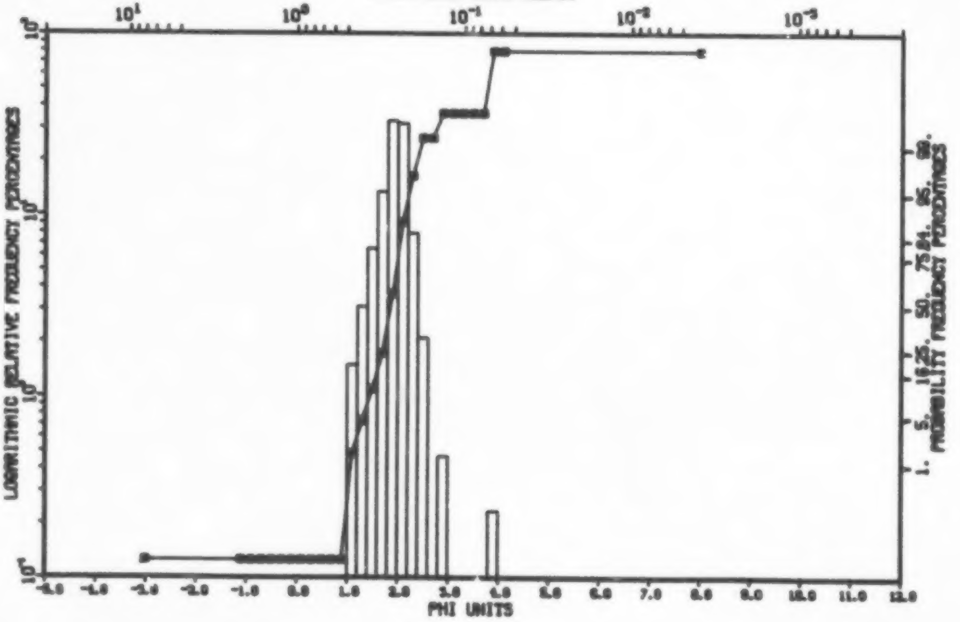
Crest of large aeolian dune



Middle Barrier #2

Sample # 2
SAMPLE NUMBER- 1371

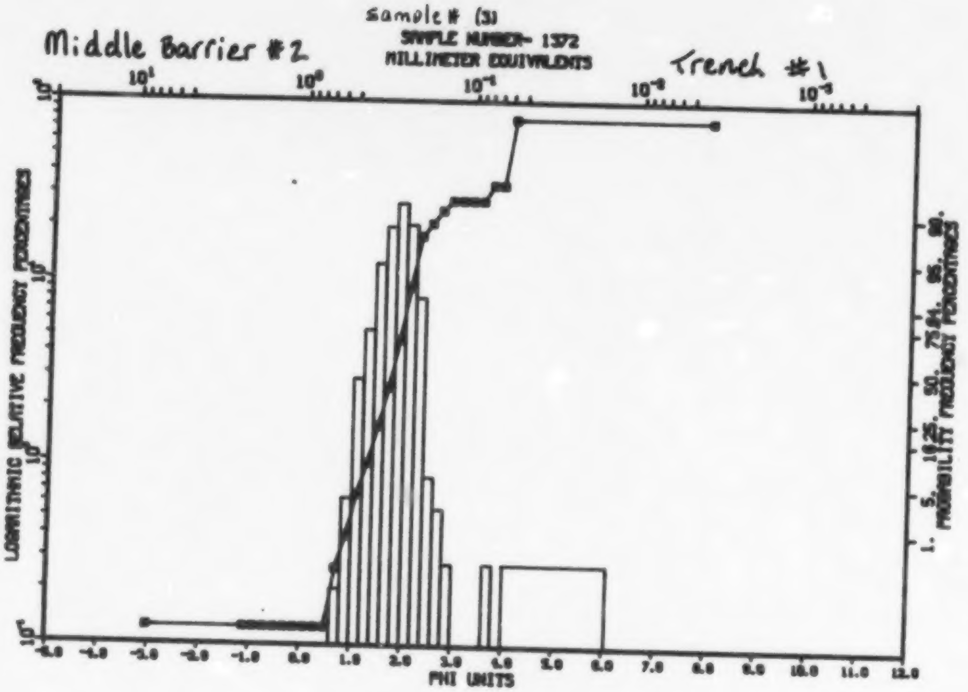
Trench #1



sample # (3)

Middle Barrier #2

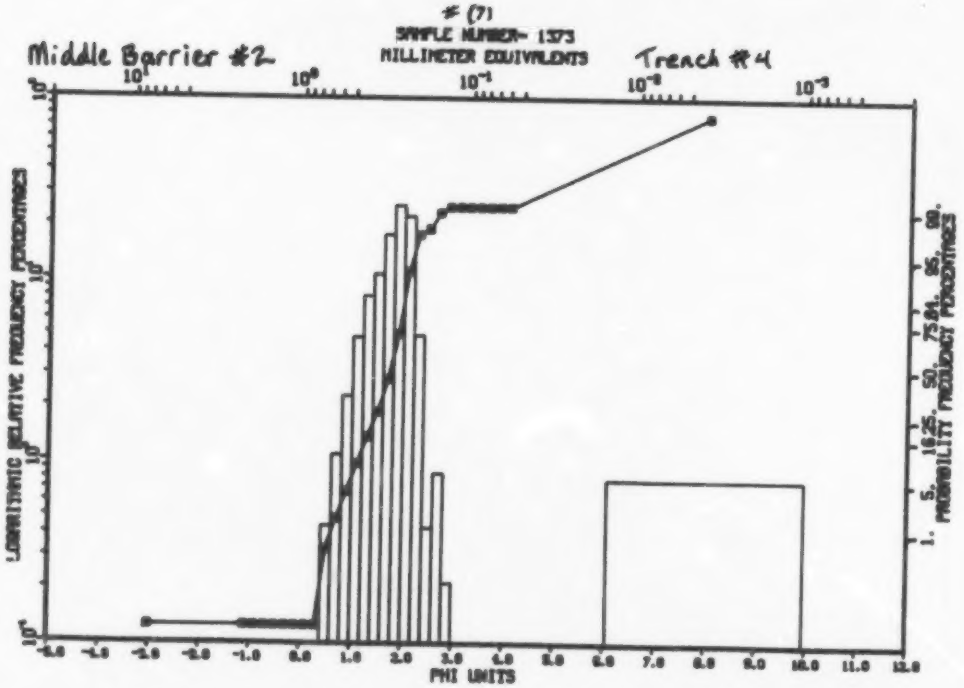
Trench #1



(7)

Middle Barrier #2

Trench #4

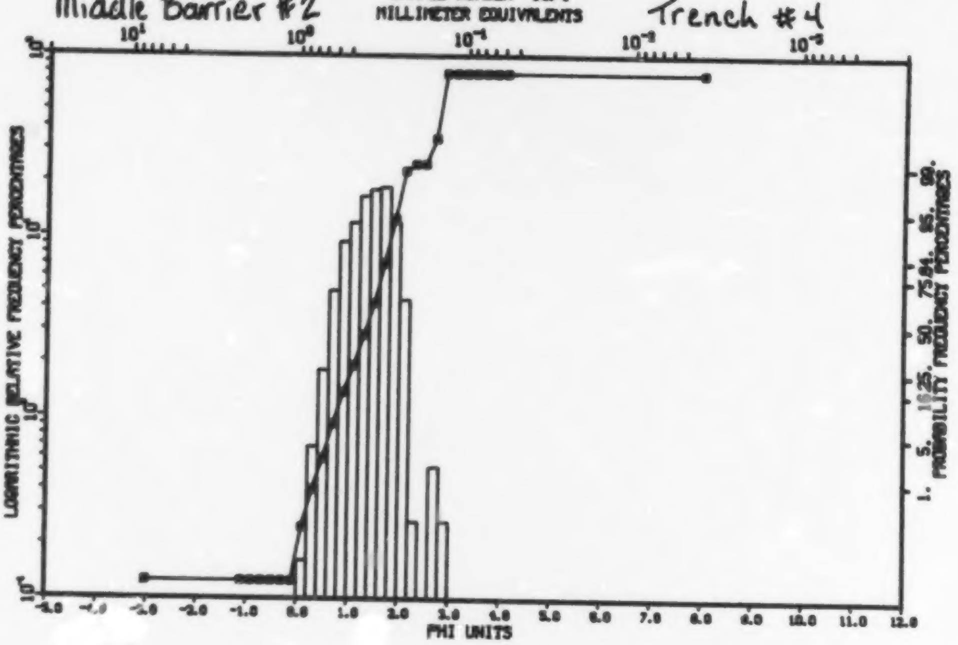


Middle Barrier #2

# (8)

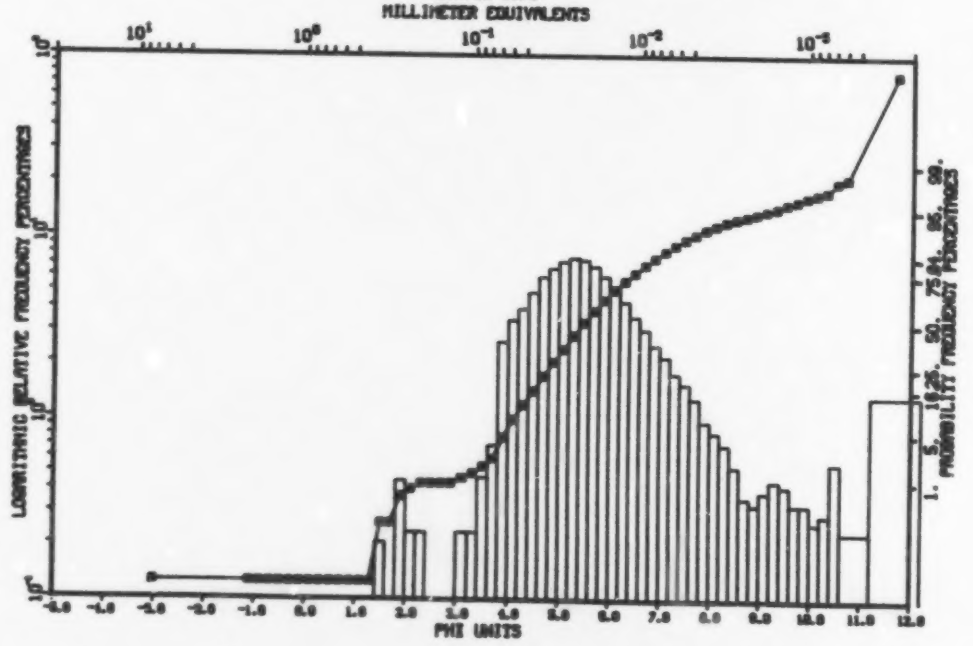
SAMPLE NUMBER- 1374

Trench #4



MIDDLE BARRIER #2 SANDUR MUD 18 CM thick(#9)

SAMPLE 1375



CHAPTER 19

SAFE 1983: HEAVY MINERAL DISTRIBUTION

By

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Cruise Objective

To observe the transport and distribution of heavy minerals on the deltas and through suspension off the delta front of Cambridge, Itirbilung and McBeth fjords.

Methods

Prior to the CSS Hudson Cruise 83-028, a survey party was sent to study the coastal areas of eastern Baffin Is. and the delta systems associated with Cambridge and Itirbilung fjords. This field party consisted of Bob Taylor, Jim Syvitski (AGC-BIO) and Bob Gilbert (Queen's University). They had the support of a helicopter to ferry the party and deploy moorings. The party deployed two arrays in each of the fjords. One array consisted of two Aanderaa current meters and one Aanderaa thermistor chain. The other array consisted of three conventional sediment traps (Syvitski *et al.*, 1984) and two magnetic sediment traps (see Fig. 19.1). Each array was assembled on the delta then lifted and deployed by the helicopter at the 50 m isobath (Fig. 19-2 A + B).

The party also installed two Aanderaa weather stations and an aeolian sediment trap on each of the two deltas. The equipment was recovered several weeks later while the ship was in each of the fjords (see Table 19.1 for dates and times of deployment and recovery of instrumentation).

During the ships survey of each fjord, field parties went ashore on the deltas by Boston Whaler boats to make observations and collect samples. Samples collected for heavy mineral investigation, were collected using garden trowels. Magnetic samples were collected by a small hand held magnet. This magnet allowed samples to be collected then released into sample bags (Multi-Lift Model 71 manufactured by Magnetool Inc. TROY

MICH). Samples were also collected from several pits dug in various places to see interbedding of heavy mineral layers (Fig. 19-2C). Location of samples are shown in Fig. 19-3 (Cambridge), Fig. 19-4 (McBeth side entry).

Samples were also collected in the shallow areas off the delta front. These samples were collected from a Boston Whaler using a small stainless steel Eckman dredge sampler.

On recovery of the sediment traps a white precipitate was observed on various fittings and in the conventional sediment traps. A sample of this precipitate was analyzed on the AGC - SEM/EDAX (Cambridge Stereoscan 1000) and found to be aluminum sulfate, a product of galvanic corrosion between aluminum and stainless steel. This corrosion was fast because of the cold oxygenated sea water. The precipitate was manually picked out of the small samples using conventional picking methods of micro paleontologists. Sedimentation rates were calculated and recorded in Table 19-2.

The delta and Boston Whaler samples were analyzed for grain size. All samples were split and a standard grain size analysis performed on one of the splits. This analysis consisted of the coarse fraction (> 53 microns) being analyzed using the AGC Settling Tube (Amos _et al._, 1981) and the fine fraction was analyzed using a Micro-meretics Sedigraph model 5000-D. Selective samples (coarse fraction only) were separated into magnetic and non-magnetic fractions. The magnetic fraction was demagnetized using a alternating field demagnetizer, made by Pat Ryall at Dalhousie University. This was done to eliminate any attraction between grains and thus eliminate mass settling of these grains. Both fractions were then analyzed using the settling tube. The data was presented in equivalent spherical diameters of quartz and in the case of the magnetic fraction also presented in its equivalent spherical diameters of magnetite (see Tables 19.3 and 19.4).

Future Work

Similar magnetic separations and grain size analysis will be performed on grab samples collected by Hudson and its launches. Samples will also be analyzed from sub-samples of piston cores. This work conducted on the cores will show the sedimentation rate of heavy minerals.

Once all samples have been analyzed for grain size individual size fraction can be further separated using a magnetic separator. These separates can then be analyzed on the SEM-EDAX system for mineralogy. The finer fractions between 6-4 phi material may also be analyzed for magnetic susceptibility.

References

Amos, C.L., Asprey, K.W., and Rodgers, N.A. (1981), Bedford Institute of Sedimentation Tube - B.I.S.T. Report Series/BI-R-81-14/September 1981, pp 60.

Syvitski, J.P.M., Asprey, K.W., Clattenburg, D.C., and Hodge, G.D. (1984), The Prodelta Environment of a Fjord: Suspended Particle Dynamics. Sedimentary, Vol. 31, p 800-826.

Figure 19.1

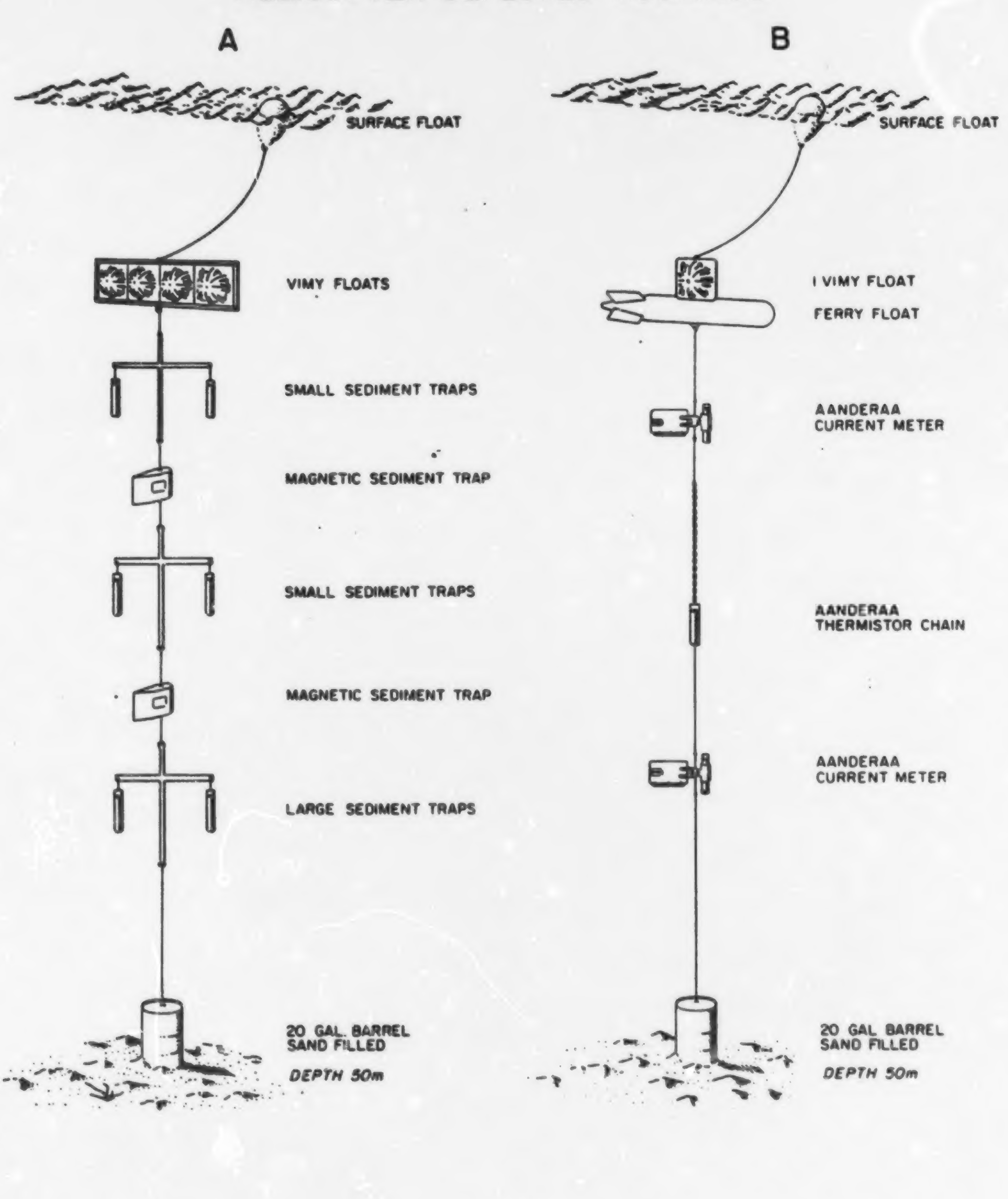

HELICOPTER DEPLOYED MOORINGS
A
B
SURFACE FLOAT
VIMY FLOATS
SMALL SEDIMENT TRAPS
MAGNETIC SEDIMENT TRAP
SMALL SEDIMENT TRAPS
MAGNETIC SEDIMENT TRAP
LARGE SEDIMENT TRAPS
20 GAL. BARREL SAND FILLED
DEPTH 50m
SURFACE FLOAT
I VIMY FLOAT
FERRY FLOAT
AANDERAA CURRENT METER
AANDERAA THERMISTOR CHAIN
AANDERAA CURRENT METER
20 GAL. BARREL SAND FILLED
DEPTH 50m

Figure 19.2

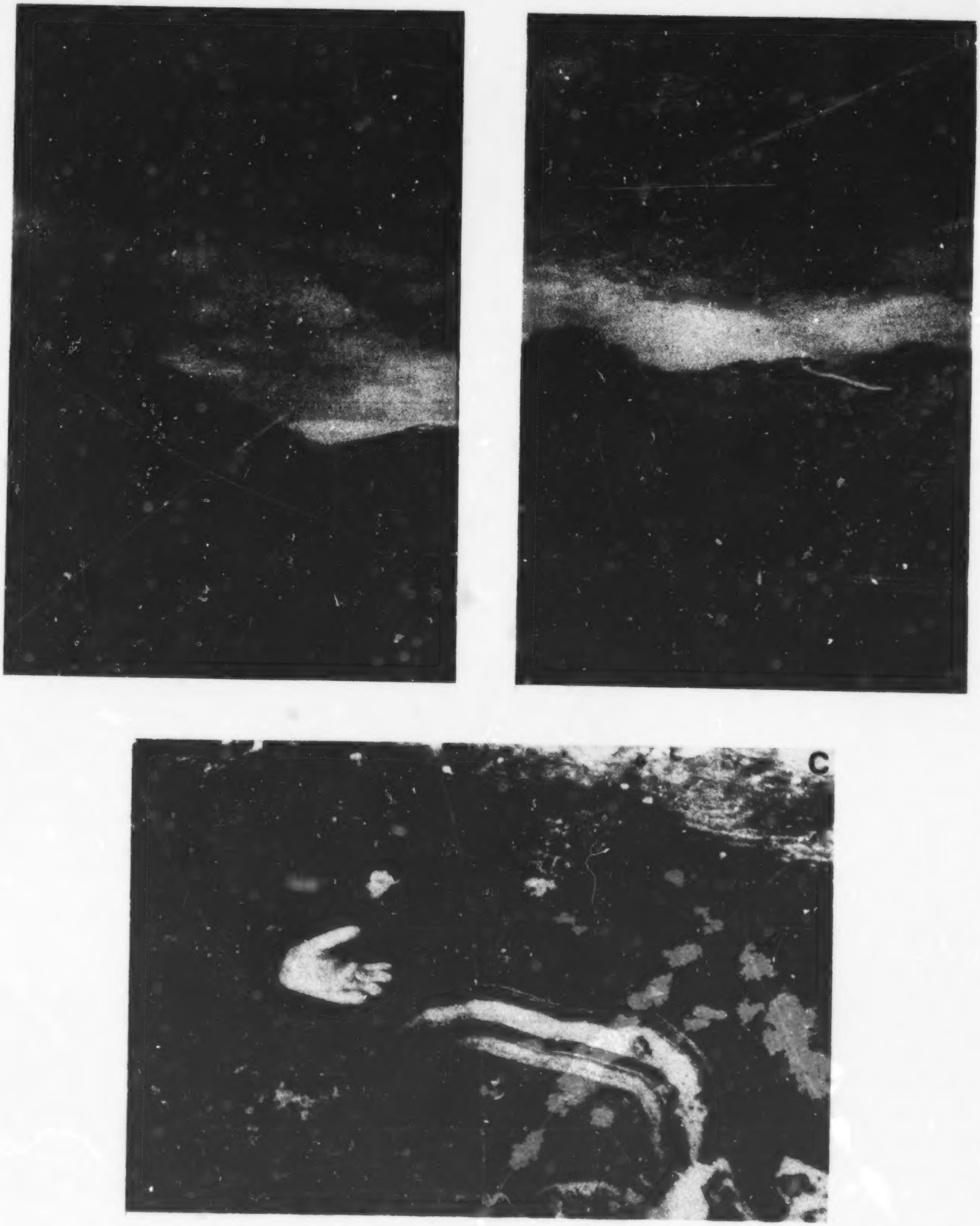


TABLE 19.1

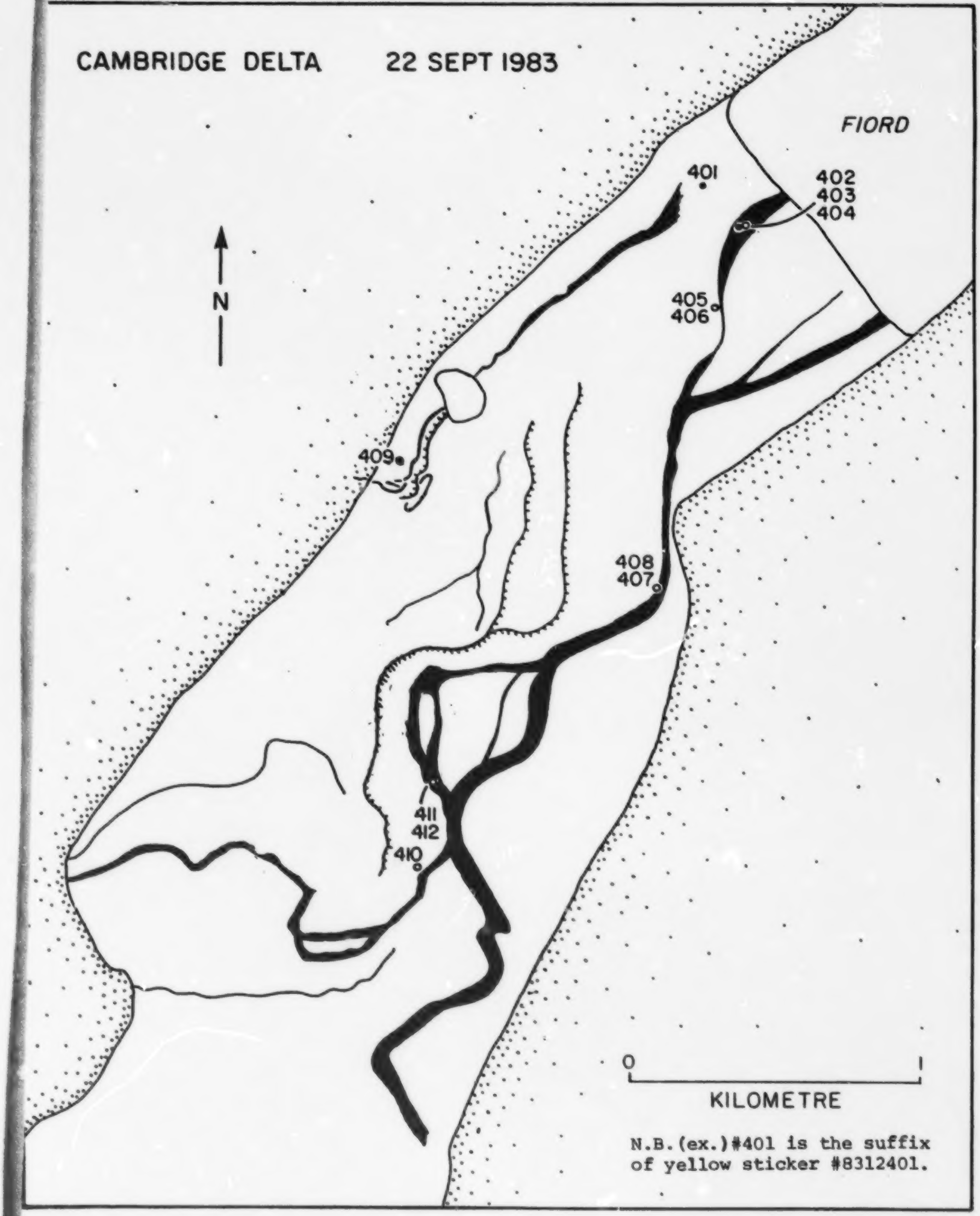
INSTRUMENT DEPLOYMENT - 1983
CAMBRIDGE FJORD

Instrument Type	Day/Time Deployed	Day/Time Recovered	Depth (m)
Conventional Sediment Trap	253 1800	266 0930	5
Magnetic Sediment Trap	253 1800	266 0930	15
Conventional Sediment Trap	253 1800	266 0930	25
Magnetic Sediment Trap	253 1800	266 0930	35
Conventional Sediment Trap	253 1800	266 0930	45
Current Meter	253 1747	266 0845	7
Thermister Chain	253 1747	266 0845	10-40
Current Meter	253 1747	266 0845	45
Weather Station	253 1830	266 1700	
Aeolian Sediment Trap	253 1830	266 1700	

ITIRBILUNG FJORD

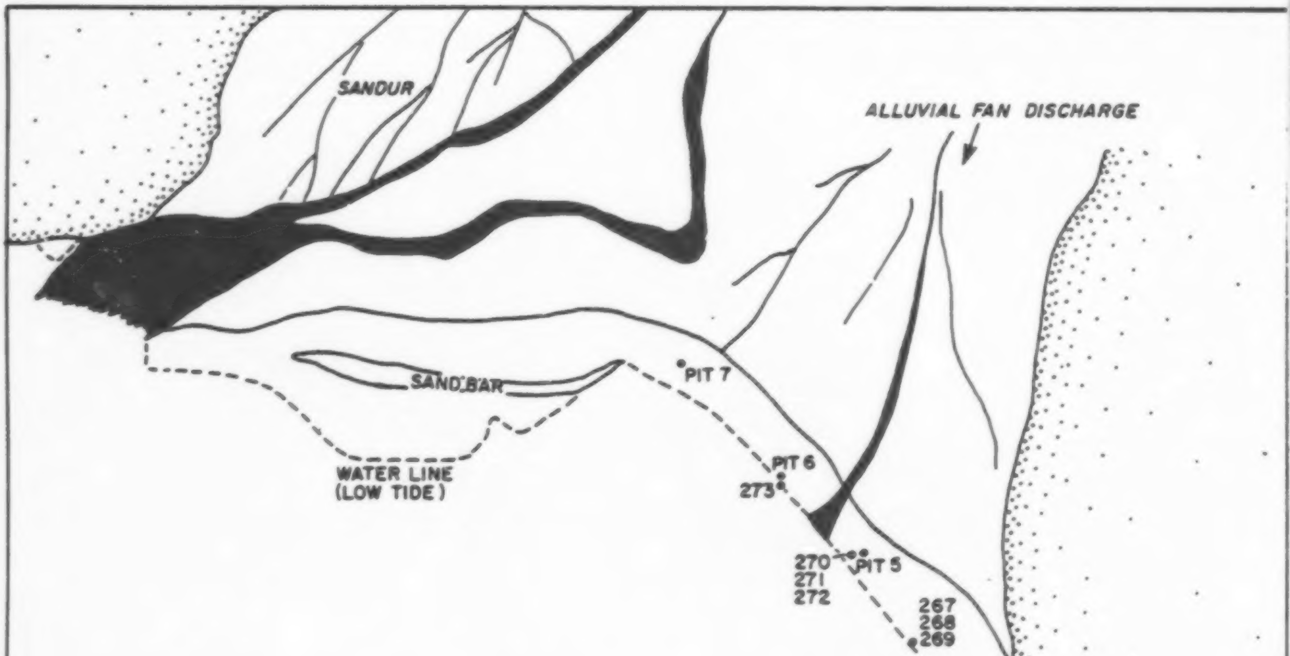
Instrument Type	Day/Time Deployed	Day/Time Recovered	Depth (m)
Conventional Sediment Trap	252 1555	270 0100	5
Magnetic Sediment Trap	252 1555	270 0100	15
Conventional Sediment Trap	252 1555	270 0100	25
Magnetic Sediment Trap	252 1555	270 0100	35
Current Meter	252 1600	270 0930	7
Thermistor Chain	252 1600	270 0930	10-40
Current Meter	252 1600	270 0930	45
Weather Station	252 1630	270 1030	
Aeolian Sediment Trap	252 1630	270 1030	

Figure 19.3



N.B.(ex.)#401 is the suffix of yellow sticker #8312401.

Figure 19.4



N.B.(ex.)#273 is the suffix of yellow sticker #8312273.

TABLE 19.2

SEDIMENT TRAP DATA

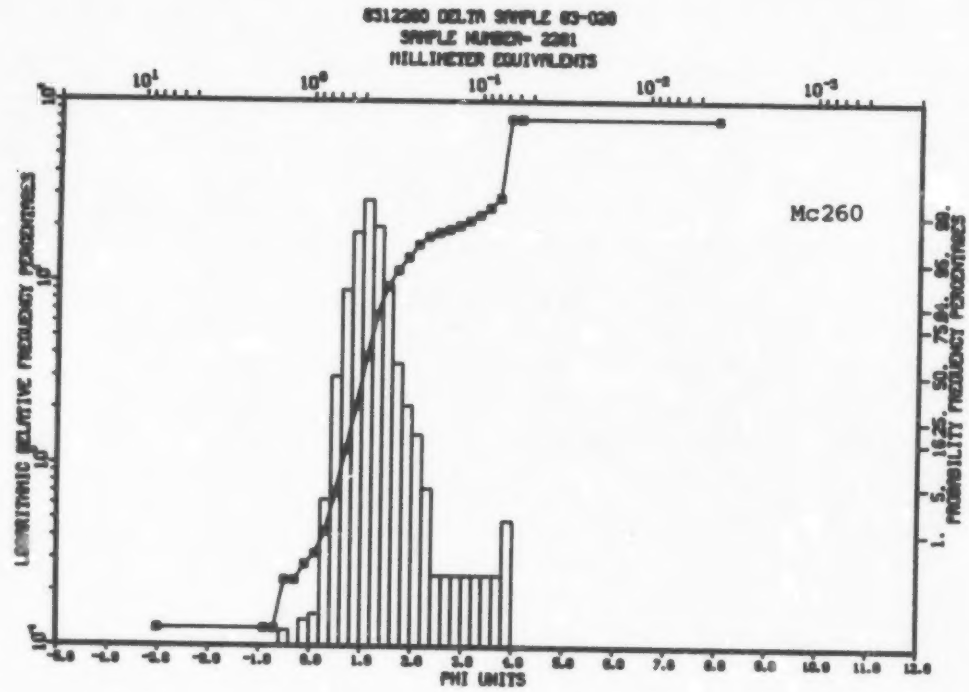
Fjord	Type of Trap	Depth (m)	Sedimentation Rates	Units
CAMBRIDGE	Conventional	5	3.79	$g/m^2/day$
	Magnetic	15	9.23×10^{-4}	g/day
	Conventional	25	1.19	$g/m^2/day$
	Magnetic	35	2.31×10^{-3}	g/day
	Conventional	45	1.75	$g/m^2/day$
ITIRBILUNG	Conventional	5	1.29	$g/m^2/day$
	Magnetic	15	6.67×10^{-4}	g/day
	Conventional	25	6.27×10^{-1}	$g/m^2/day$
	Magnetic	35	1.17×10^{-3}	g/day

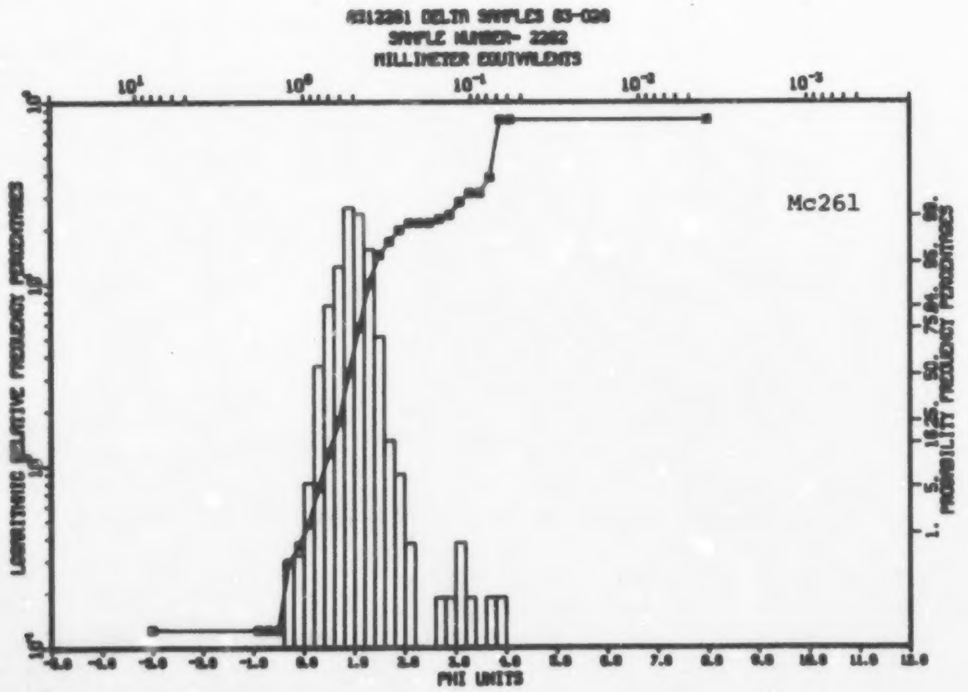
TABLE 19.3

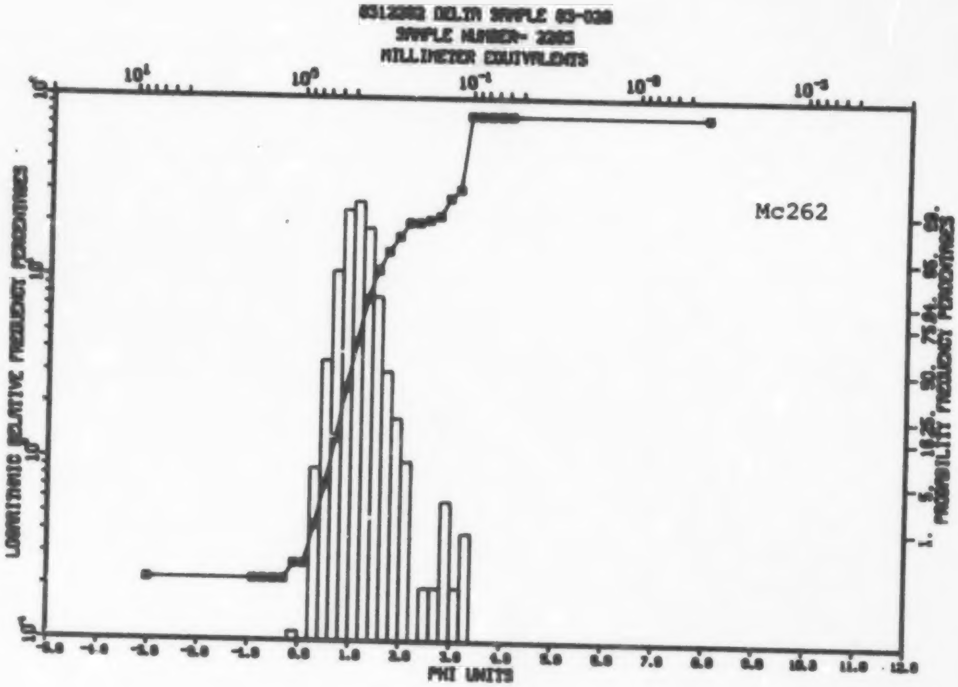
Sample #	Yellow sticker number	% Sand	% Magnetite (Sand)	% Mud	% Magnetite (Mud)
CAMBRIDGE BOSTON WHALER SAMPLES					
2063	8315564	69.8	0.5	28.8	0.4
2064	8315565	95.6	0.4	4.2	0.2
2065	8315566	92.9	0.3	1.1	0.006
2066	8315567	94.2	0.6	4.2	0.1
2067	8315568	89.2	0.5	8.7	0.1
2068	8315569	87.3	0.5	8.9	0.2
2069	8315570	93.9	0.6	5.9	0.1
2070	8315572	81.6	0.9	18.1	0.2
2071	8315573	92.0	0.8	6.7	0.1
2072	8315574	93.2	0.4	6.3	0.1
CAMBRIDGE AND MCBETH SIDE ENTRY SAMPLES					
2281	8312260	100.0	100.0		
2282	8312261	100.0	100.0		
2283	8312262	99.9	12.4		
2284	8312263	93.8	47.5		
2285	8312264	99.7	3.2		
2286	8312265	94.0	0.0		
2287	8312266	97.1	0.0		
2288	8312267	98.6	73.4		
2289	8312268	85.6	66.0		
2290	8312269	100.0	0.0		
2291	8312270	98.8	0.0		
2292	8312271	86.7	1.4		
2293	8312272	100.0	0.6		
2294	8312273	99.7	1.1		
2295	8312401	97.5	1.5		
2296	8312402	98.6	4.9		
2297	8312403	87.3	5.9		
2298	8312404	99.7	1.2		
2299	8312405	98.4	0.0		
2300	8312406	100.0	3.5		
2301	8312407	98.8	12.5		
2302	8312408	99.4	11.7		
2303	8312409	15.3	0.2		
2304	8312410	99.6	0.2		
2305	8312411	96.5	3.5		
2306	8312412	100.0	0.0		

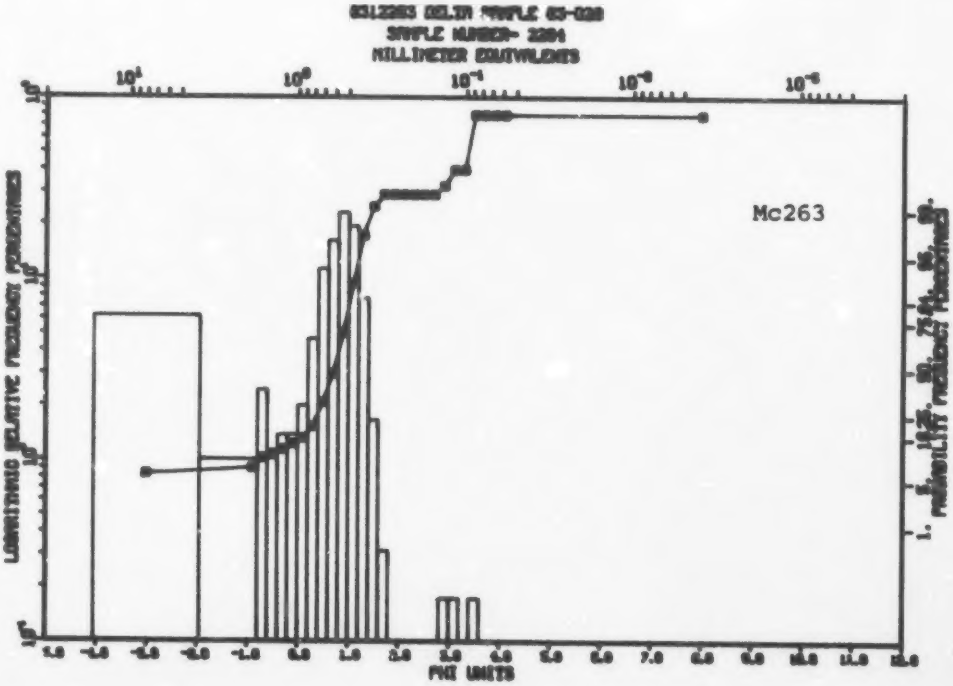
TABLE 19.4

	SIZE FRACTIONS (%)					MOMENT STATISTICS (Ø)			
Sample ID	Gravel	Sand	Mud	Silt	Clay	$\overline{X}$	σ	Sk	Kurt
2281	-	100.00	-	-	-	1.19	0.47	2.22	12.69
2282	-	100.00	-	-	-	1.01	0.43	1.86	13.57
2283	0.10	99.90	-	-	-	1.12	0.41	0.53	18.02
2284	7.03	98.97	-	-	-	0.53	1.03	-2.39	8.92
2285	0.36	99.47	0.17	0.17	-	0.78	0.52	0.50	20.69
2286	12.24	87.76	-	-	-	-0.40	0.75	-2.34	8.90
2287	3.00	96.86	0.14	0.14	-	0.47	0.72	-2.53	18.44
2288	1.86	98.14	-	-	-	0.90	0.71	-2.02	15.31
2289	14.87	85.13	-	-	-	0.31	1.47	-1.44	4.00
2290	-	99.69	0.31	0.31	-	1.00	0.41	2.81	21.23
2291	1.20	98.80	-	-	-	0.89	0.63	-2.12	20.67
2292	13.53	86.33	0.14	0.14	-	0.35	1.44	-1.43	4.25
2293	-	100.00	-	-	-	1.25	0.37	1.06	8.46
2294	0.30	99.70	-	-	-	0.77	0.57	0.12	11.36
2295	2.50	97.50	-	-	-	1.36	0.93	-2.44	13.36
2296	1.40	98.42	0.18	0.18	-	0.99	0.80	-1.17	11.09
2297	12.81	86.88	0.31	0.31	-	0.73	1.62	-1.28	4.00
2298	0.30	99.70	-	-	-	1.34	0.58	-0.51	13.13
2299	1.60	98.40	-	-	-	1.17	0.73	-2.78	18.09
2300	-	99.77	0.23	0.23	-	1.72	0.42	0.27	8.28
2301	1.20	98.58	0.22	0.22	-	1.23	0.75	-1.73	14.18
2302	0.60	99.40	-	-	-	1.50	0.70	-1.29	12.47
2303	22.64	14.14	63.22	54.45	8.77	3.69	4.14	-0.66	1.90
2304	0.40	99.12	0.48	0.48	-	1.82	0.84	-0.43	6.83
2305	3.61	96.23	0.16	0.16	-	1.07	1.01	-2.16	9.95
2306	0.05	99.95	-	-	-	0.96	0.50	0.34	3.91
Magnetite Samples Run Using 5.18 Specific Gravity									
2281	-	99.15	0.85	0.85	-	1.89	0.44	2.25	13.73
2282	-	99.68	0.32	0.32	-	1.72	0.40	1.74	13.47
2283	.10	99.44	0.46	0.46	-	1.66	0.39	0.13	34.10
2284	6.20	93.36	0.44	0.44	-	1.36	1.17	-3.05	12.14
2288	1.40	98.21	0.39	0.39	-	1.83	0.73	-3.80	28.38
2289	14.40	85.60	-	-	-	1.18	1.75	-1.85	4.74
2297	12.70	86.84	0.46	0.46	-	1.78	1.87	-1.99	5.43
2298	0.30	99.70	-	-	-	2.18	0.46	-3.98	48.15
2299	1.60	98.11	0.29	0.29	-	1.86	0.78	-3.67	24.51
2300	-	100.00	-	-	-	2.23	0.36	-0.41	3.68
2301	1.20	98.63	0.17	0.17	-	2.30	0.67	-5.76	46.46
2302	0.60	98.54	0.86	0.86	-	2.27	0.56	-4.41	48.68
2305	3.50	96.18	0.32	0.32	-	2.10	1.03	-4.21	21.53
2306	0.04	99.83	0.13	0.13	-	1.66	0.48	0.24	4.18
Non-Magnetic Samples Run Using 2.65 Specific Gravity									
2283	0.10	99.90	-	-	-	1.16	0.43	0.98	18.71
2284	6.46	93.54	-	-	-	0.49	1.05	-2.08	8.04
2288	1.86	98.14	-	-	-	0.62	0.66	-1.93	16.29
2289	15.24	84.76	-	-	-	-0.12	1.30	-1.34	3.65
2297	13.29	86.71	-	-	-	0.71	1.59	-1.35	4.12
2298	0.30	99.51	0.19	0.11	-	1.34	0.61	-0.21	11.58
2300	-	100.00	-	-	-	1.71	0.37	-0.59	5.80
2301	1.20	98.64	0.16	0.16	-	1.13	0.87	-0.38	8.39
2302	0.60	99.22	0.18	0.18	-	1.56	0.80	-0.88	8.87
2305	3.59	96.41	-	-	-	1.07	1.09	-1.64	7.57

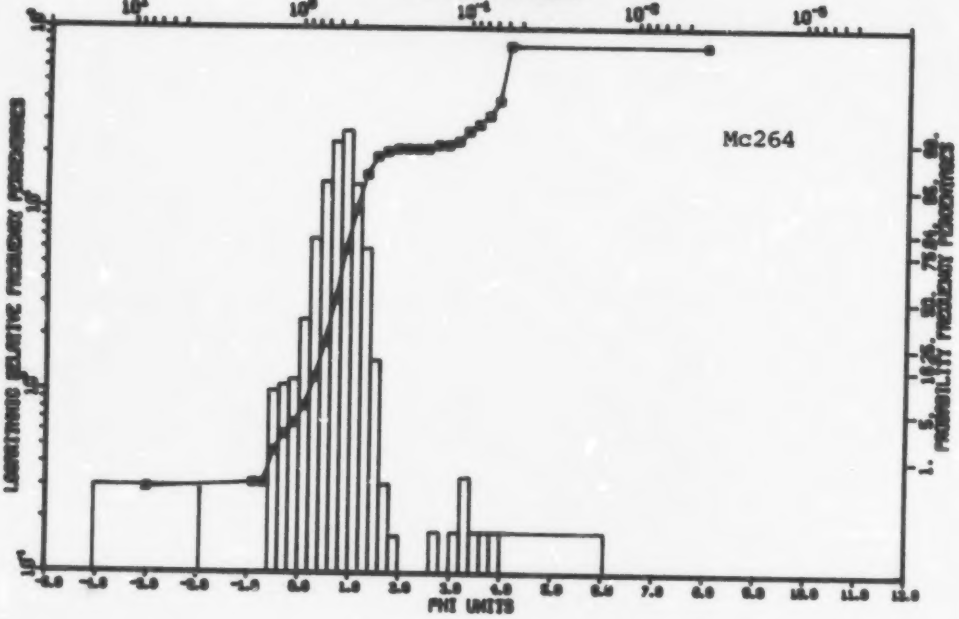

8312280 DELTA SAMPLE 83-020
SAMPLE NUMBER- 2281
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Mc260
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


8312281 DELTA SAMPLES 83-020
SAMPLE NUMBER- 2282
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Mc261
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

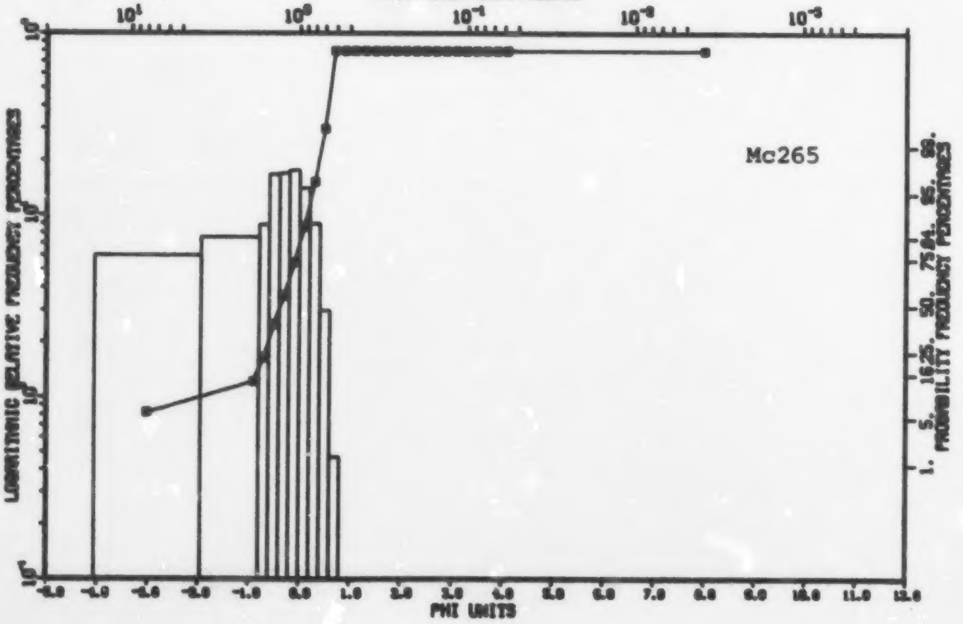

8312282 DELTA SAMPLE 83-038
SAMPLE NUMBER- 2283
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Mc262
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

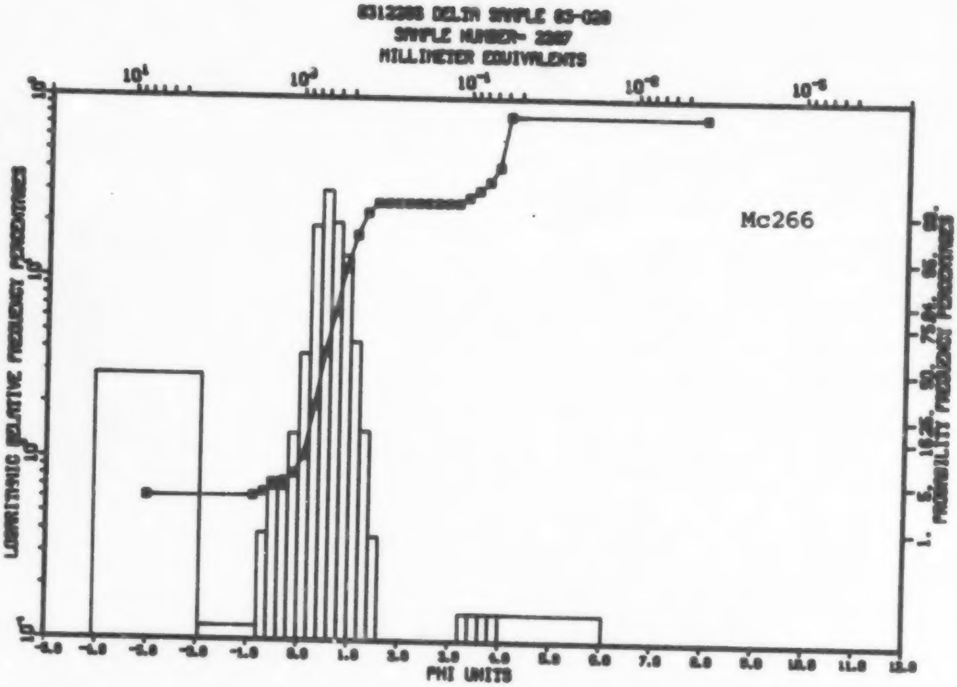

8312283 DELTA SAMPLE 83-038
SAMPLE NUMBER- 2284
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Mc263
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.
95.
99.
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

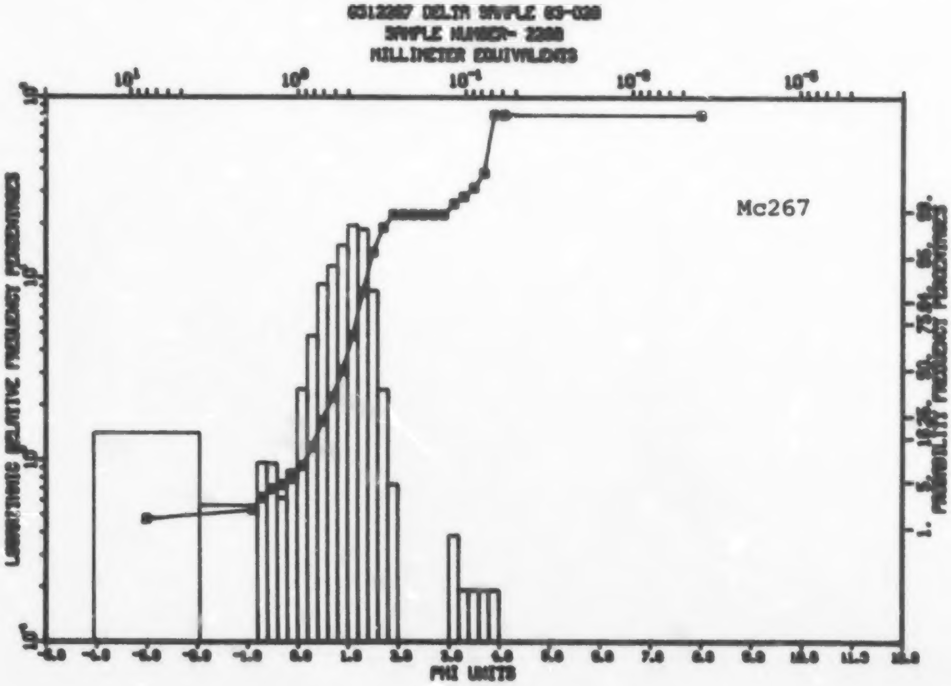
8312284 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2285
MILLIMETER EQUIVALENTS

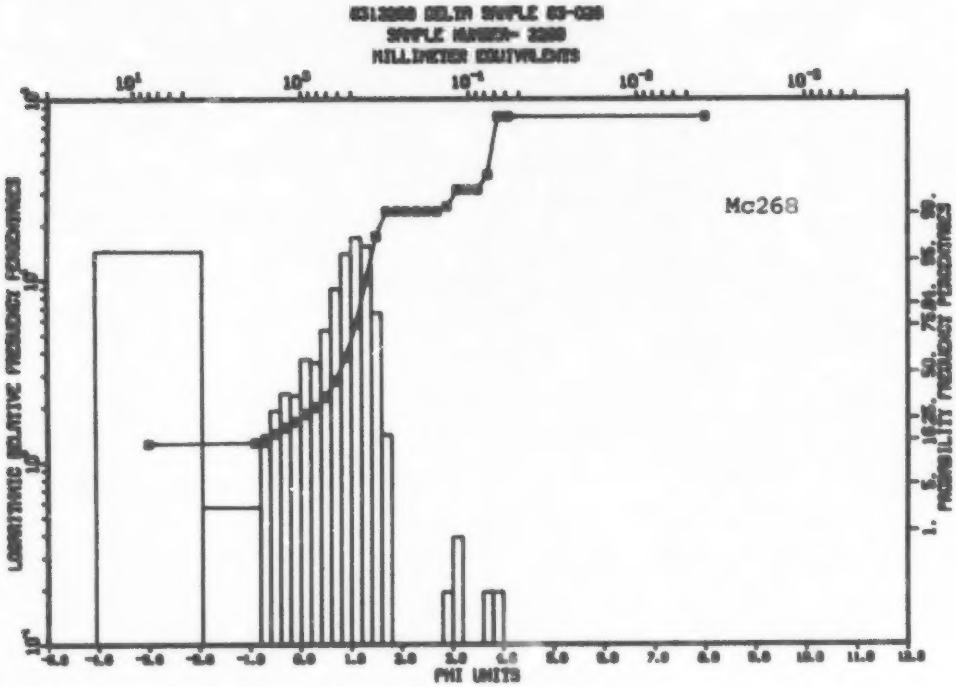


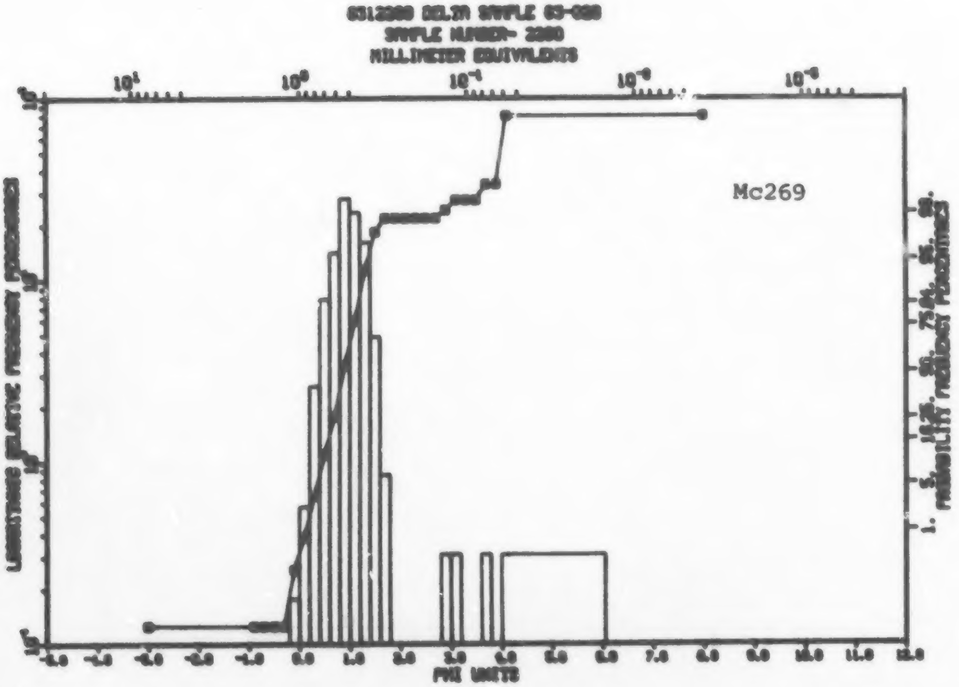
8312285 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2286
MILLIMETER EQUIVALENTS

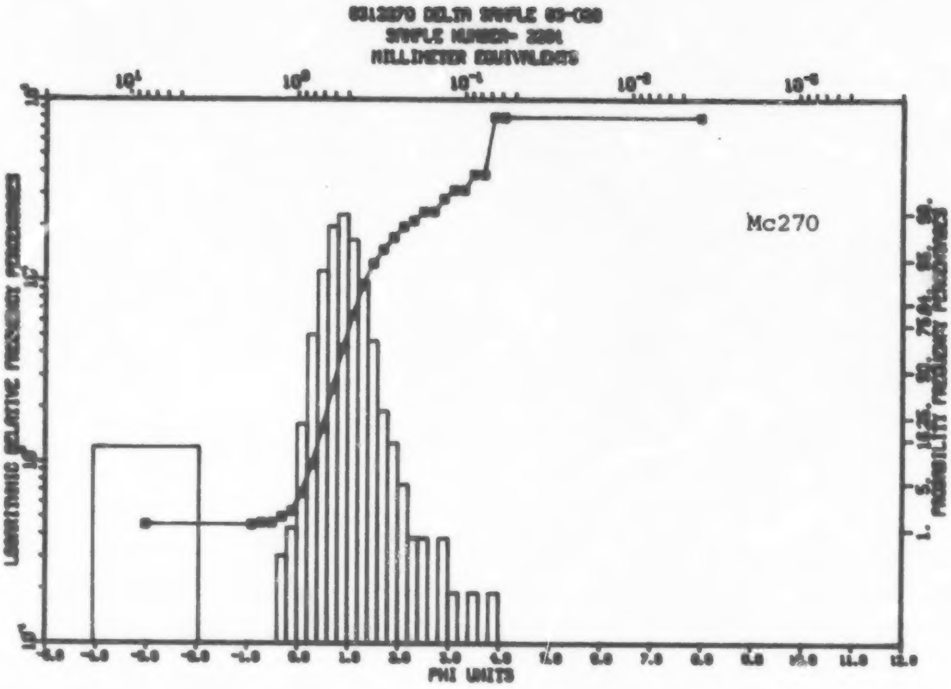


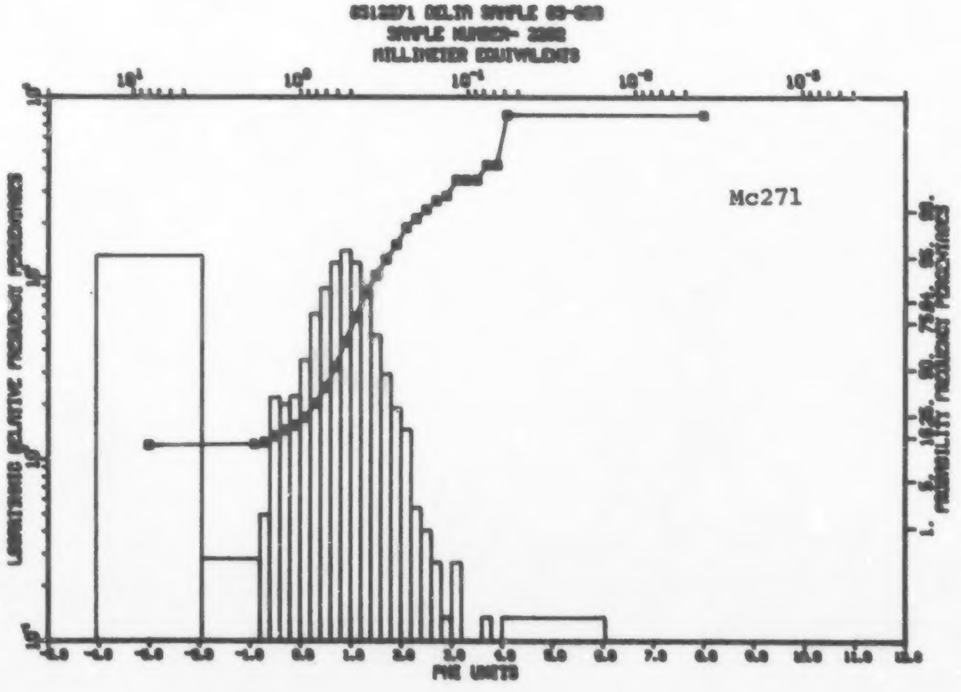

8312286 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2287
MILLIMETER EQUIVALENTS
10^1
10^0
10^-1
10^-2
10^-3
Mc266
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

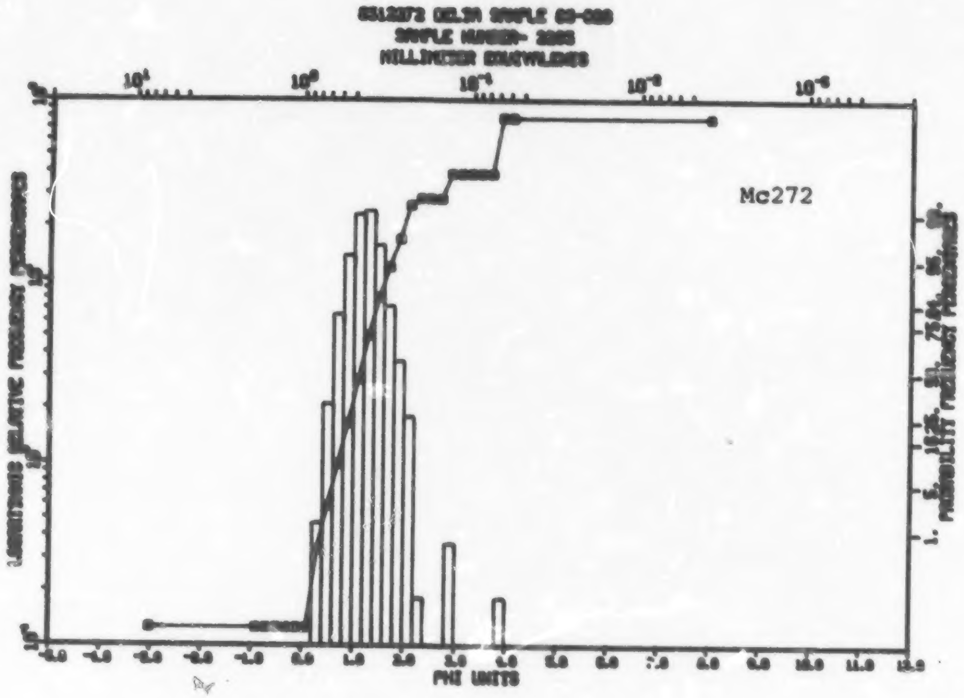

8312287 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2288
MILLIMETER EQUIVALENTS
10^1
10^0
10^-1
10^-2
10^-3
Mc267
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

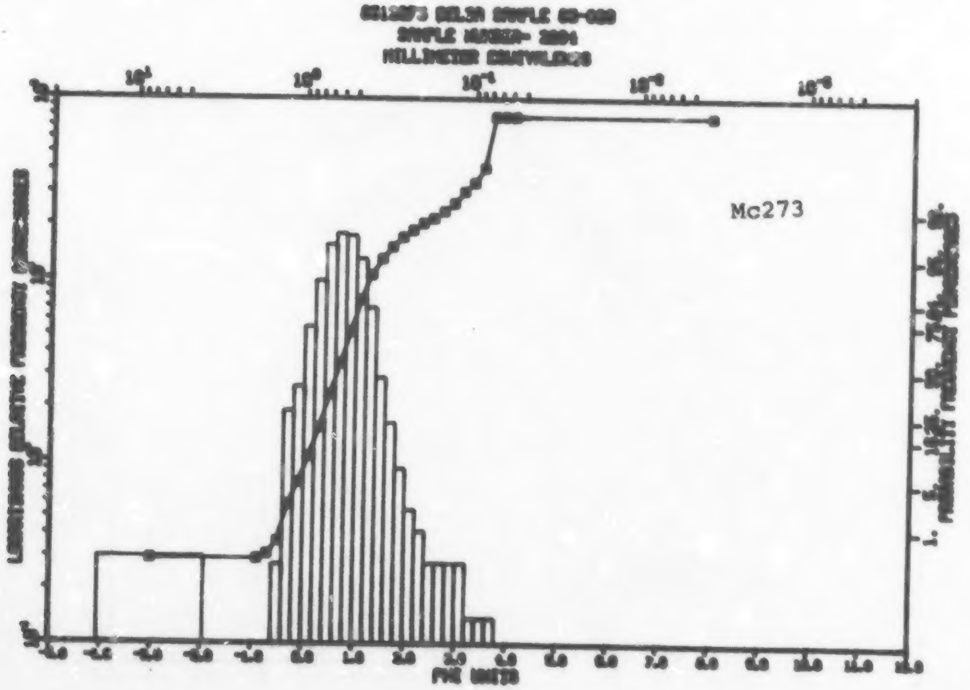

8312080 DELTA SAMPLE 83-030
SAMPLE NUMBER- 2280
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{0}
10^{1}
10^{2}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
84.
95.
99.
Mc268
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

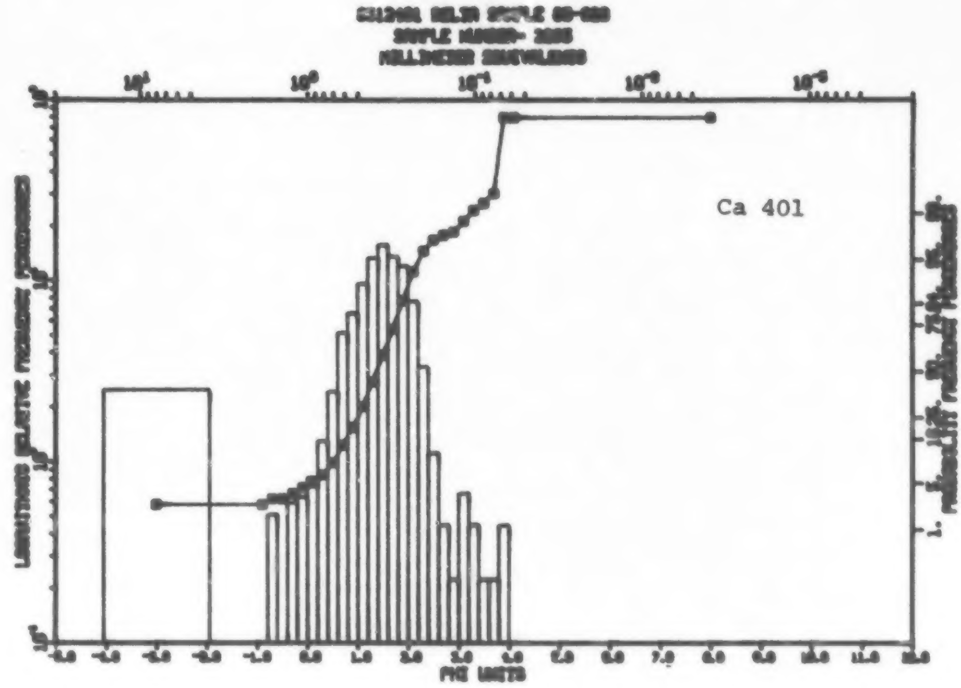

8312080 DELTA SAMPLE 83-030
SAMPLE NUMBER- 2280
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{0}
10^{1}
10^{2}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
84.
95.
99.
Mc269
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

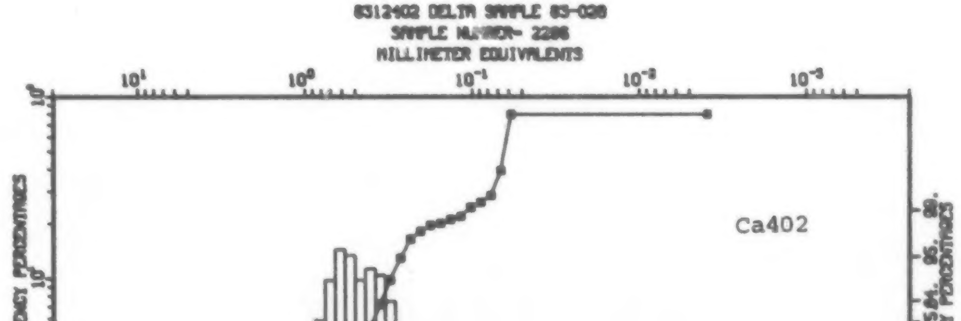

8312270 DELTA SAMPLE 83-038
SAMPLE NUMBER- 2201
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
Mc270
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

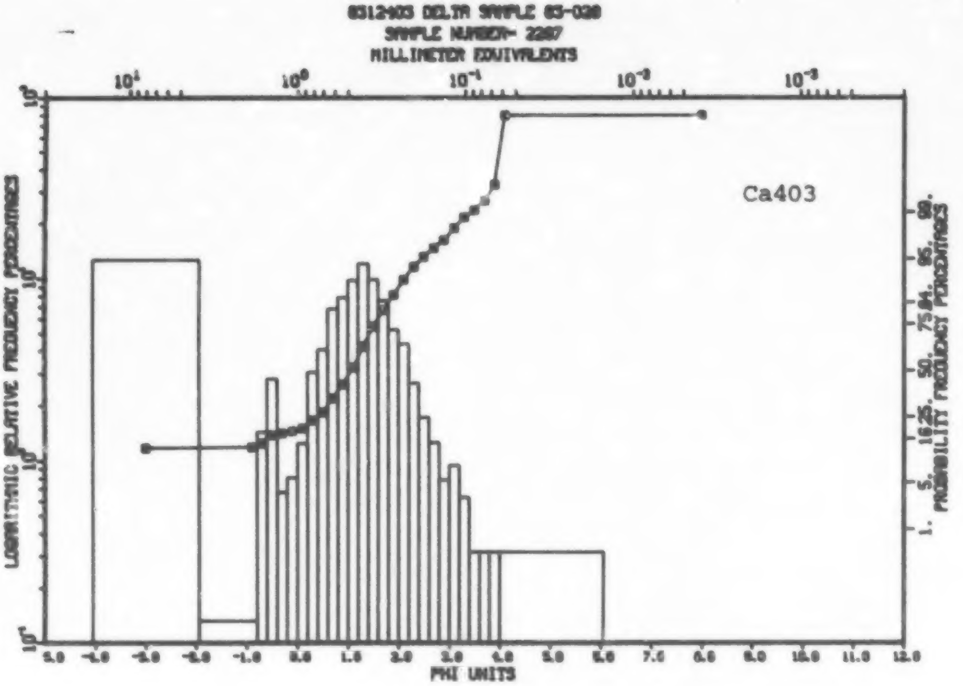

8312271 DELTA SAMPLE 83-038
SAMPLE NUMBER- 2202
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
Mc271
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

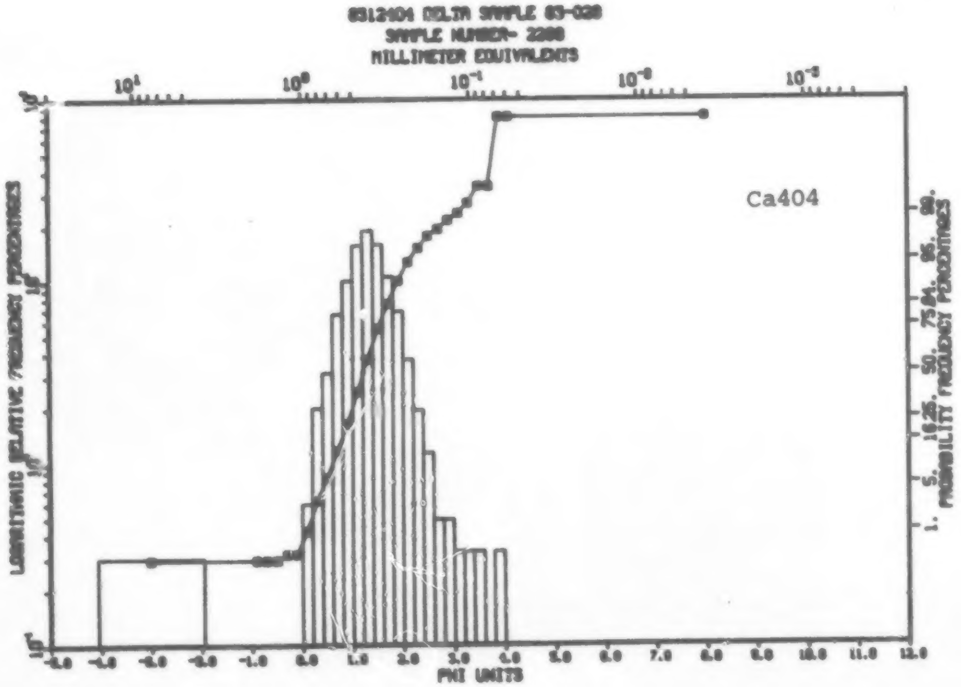

SAMPLE NUMBER- 2083
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Mc272
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

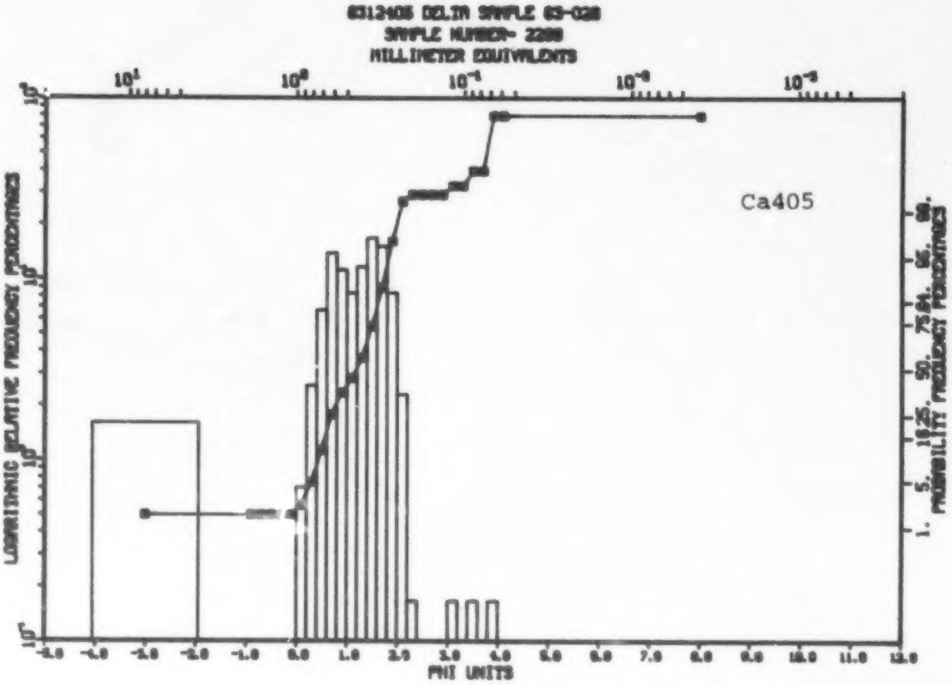

SAMPLE NUMBER- 2084
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Mc273
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

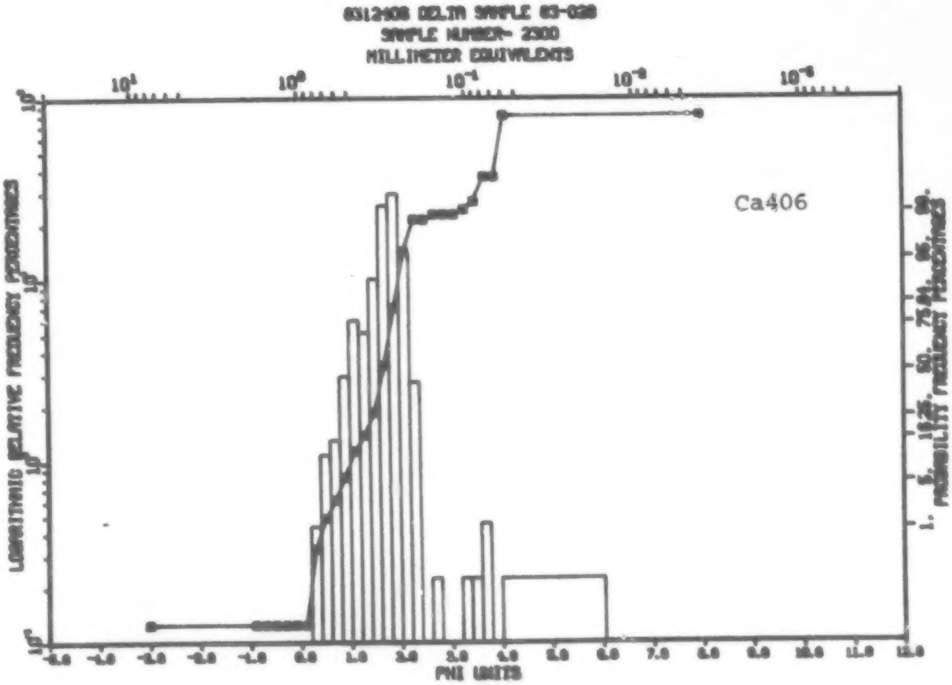

8312401 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2285
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
Ca 401
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
PHI UNITS
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0

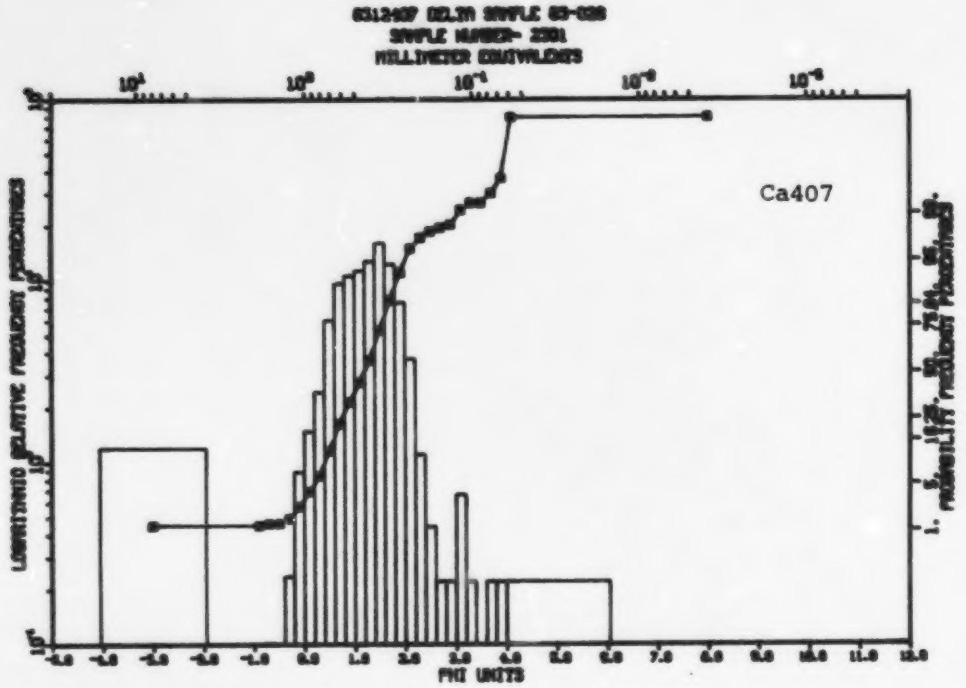

8312402 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2286
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
Ca402
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
PHI UNITS
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0

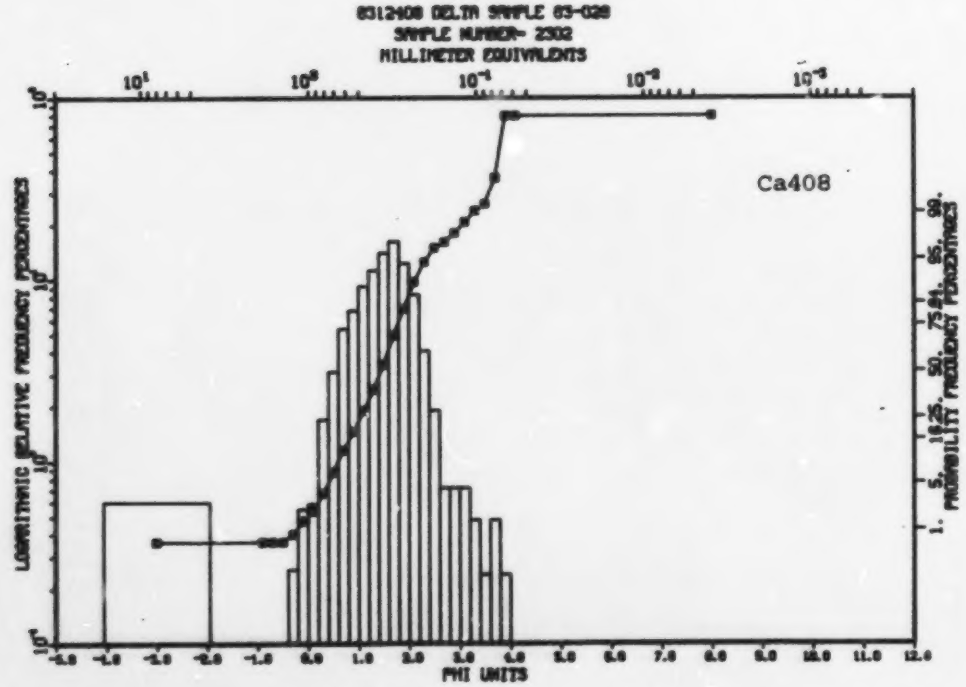

8312403 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2287
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca403
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

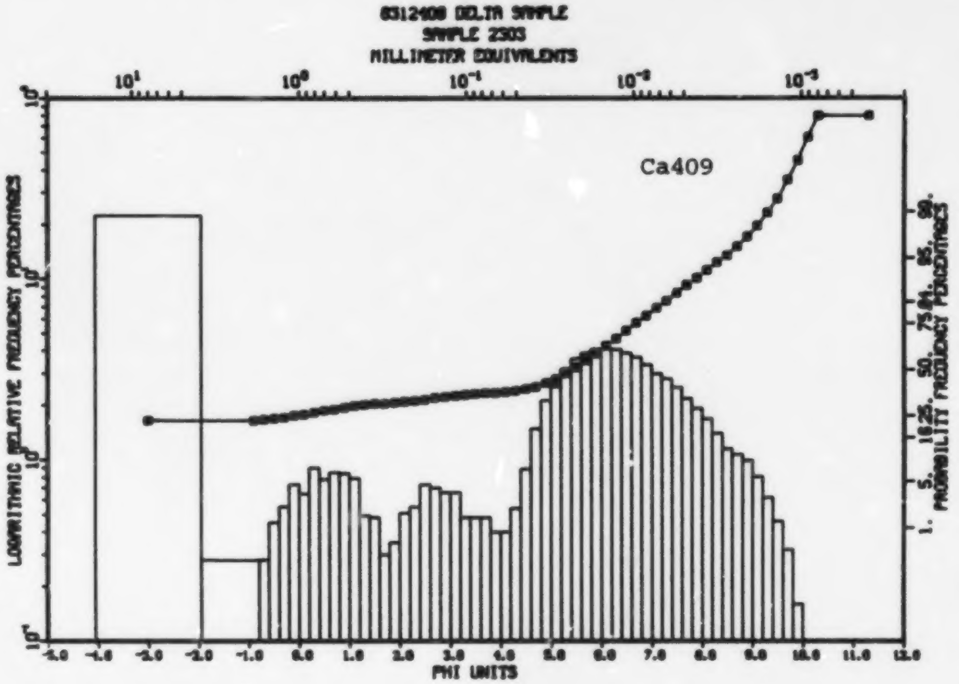

8312404 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2288
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca404
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

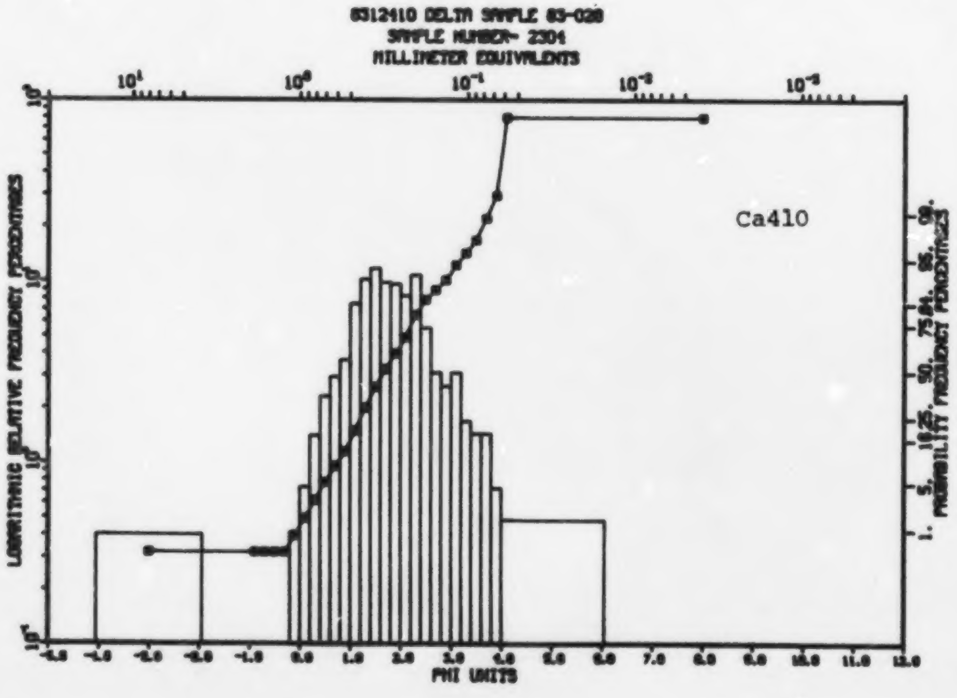

8312408 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2200
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca405
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1. 5. 10 25. 50. 75 84. 95. 99.
-4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

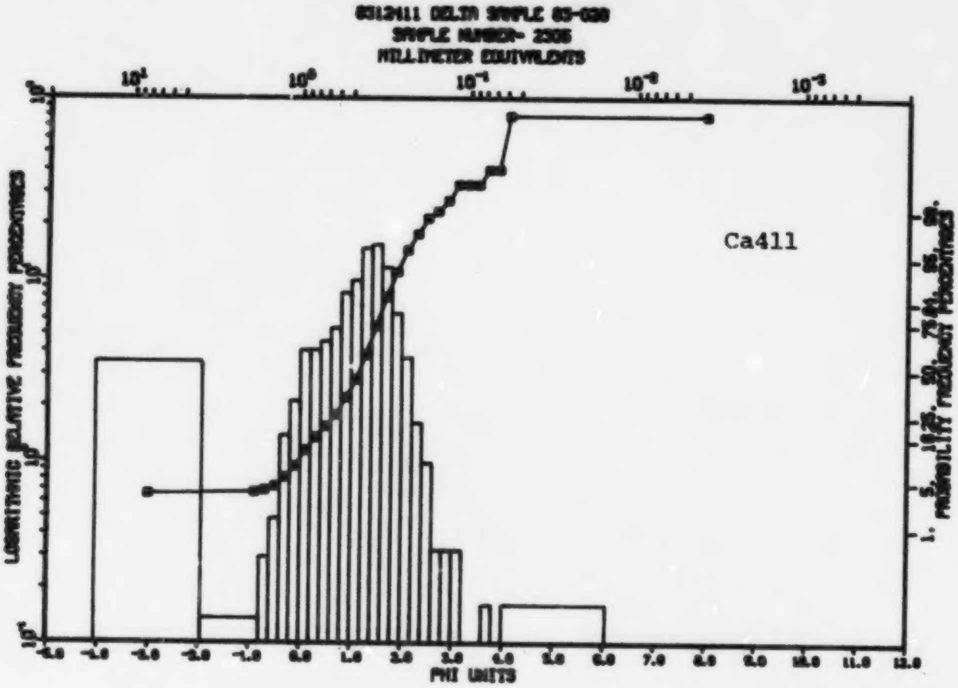

8312408 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2300
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca406
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^{-1}
PROBABILITY FREQUENCY PERCENTAGES
1. 5. 10 25. 50. 75 84. 95. 99.
-4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS

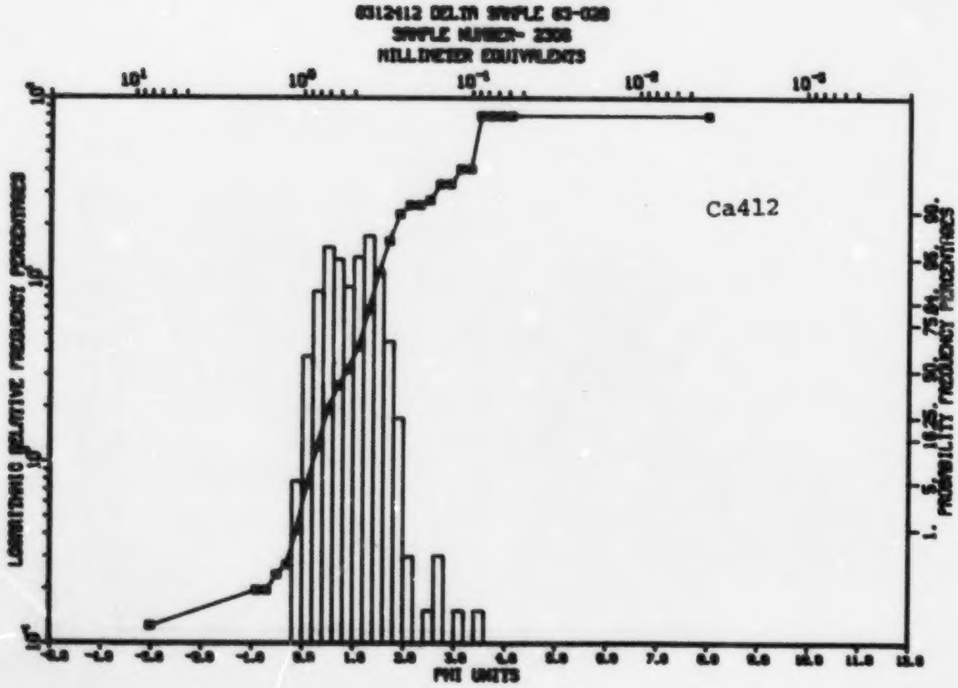

8312407 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2301
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
Ca407
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{-1}
10^{0}
10^{1}
10^{2}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


8312408 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2302
MILLIMETER EQUIVALENTS
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
Ca408
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^{-1}
10^{0}
10^{1}
10^{2}
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


8312408 DELTA SAMPLE
SAMPLE 2303
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca409
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


8312410 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2304
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca410
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS


8312411 DELTA SAMPLE 83-030
SAMPLE NUMBER- 2305
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
Ca411
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS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10^{-2}
10^{-3}
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PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
Ca412
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
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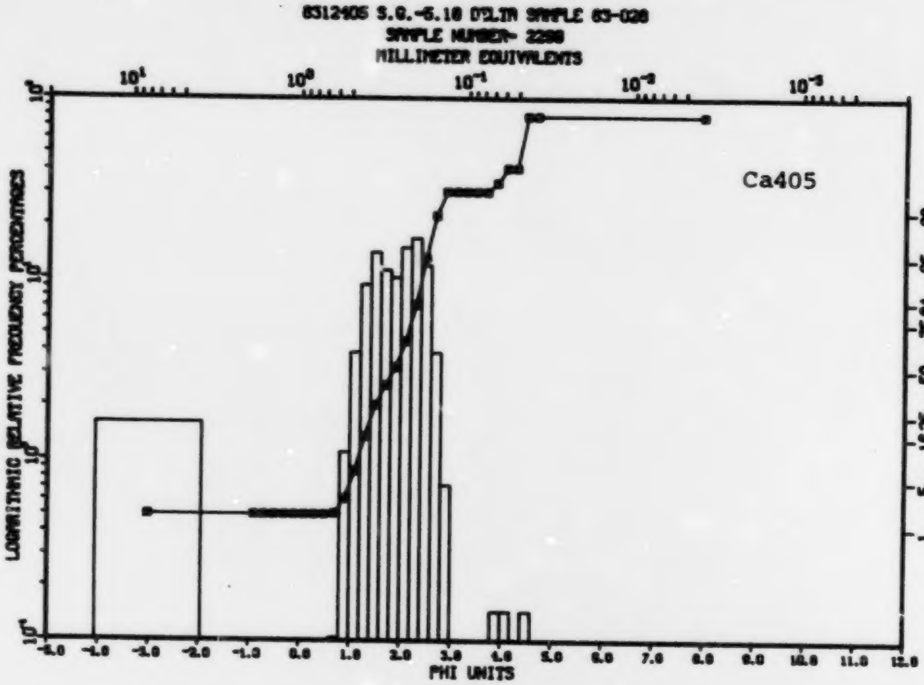
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SAMPLE NUMBER- 2298
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10^-1
10^-2
10^-3
Ca405
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^-1
PROBABILITY FREQUENCY PERCENTAGES
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5.
10.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
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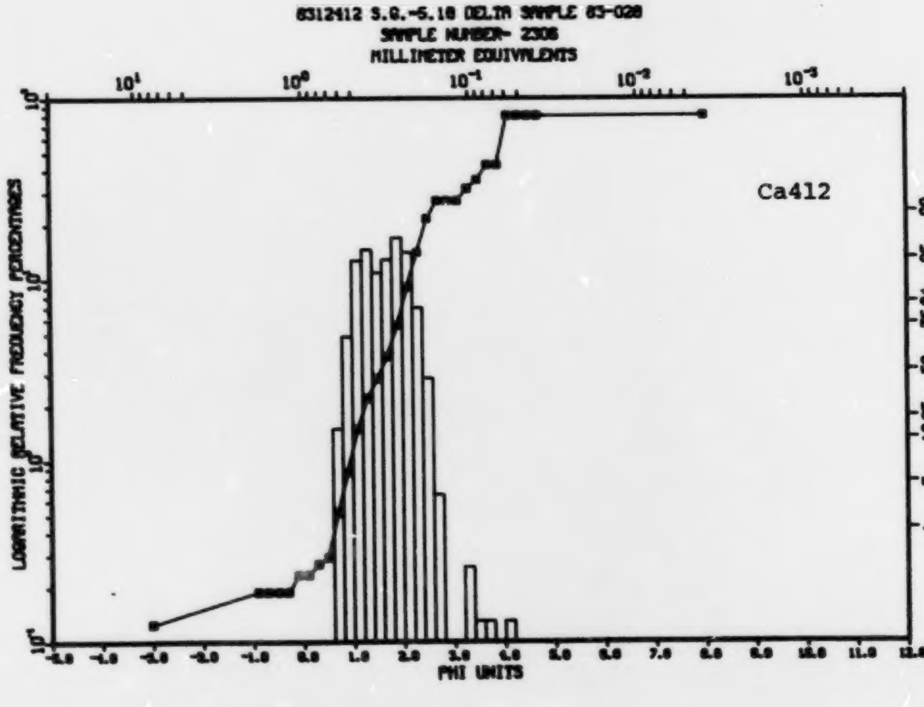
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SAMPLE NUMBER- 2306
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10^0
10^-1
10^-2
10^-3
Ca412
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
10^2
10^1
10^0
10^-1
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.
25.
50.
75.
84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
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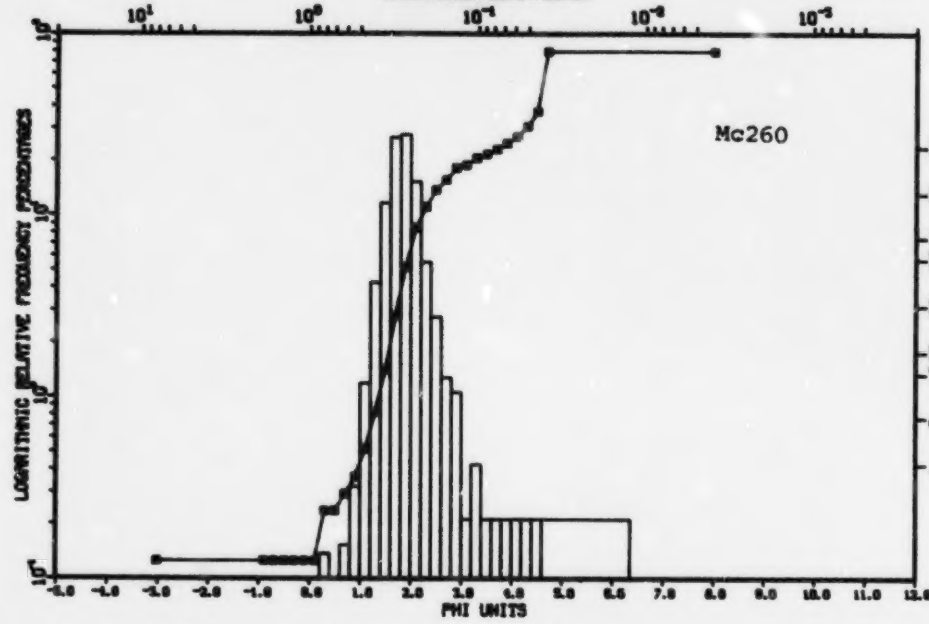
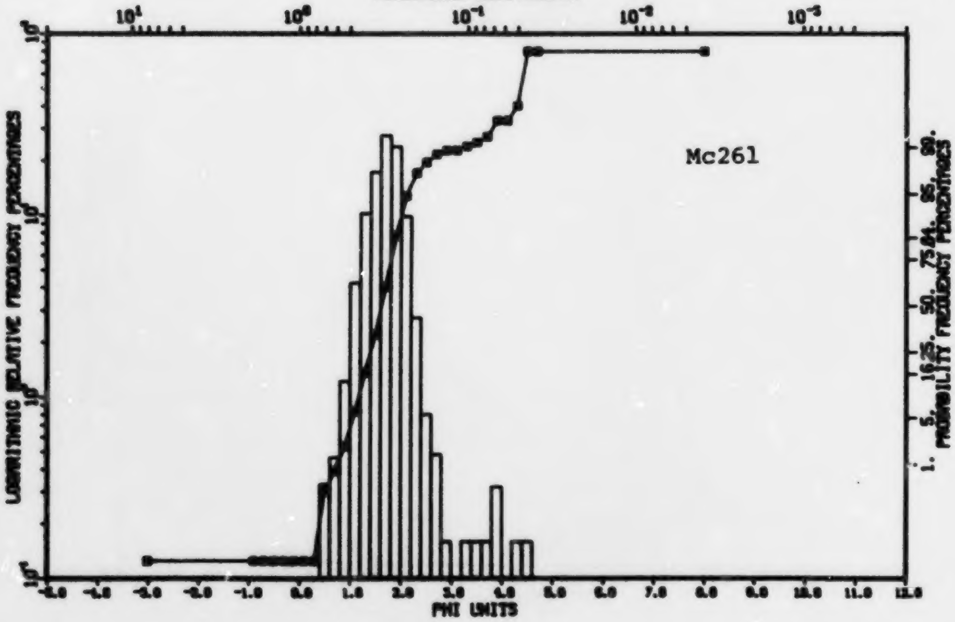
PHI UNITS

8312260 5.0.-5.10 DELTA SAMPLE 83-028
SAMPLE NUMBER- 2281
MILLIMETER EQUIVALENTS



8312261 5.0.-5.10 DELTA SAMPLES 83-028
SAMPLE NUMBER- 2282
MILLIMETER EQUIVALENTS



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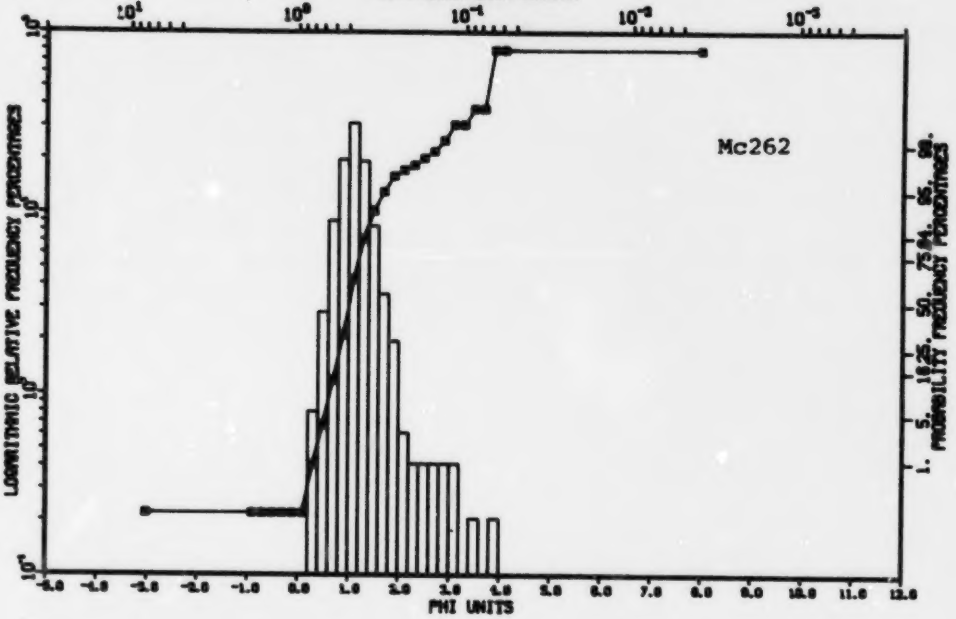

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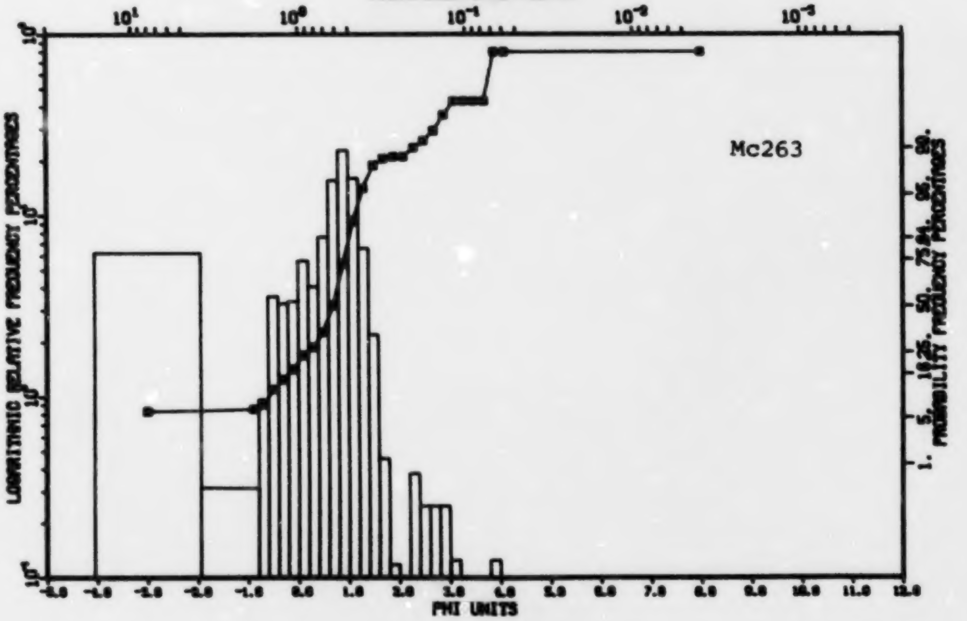

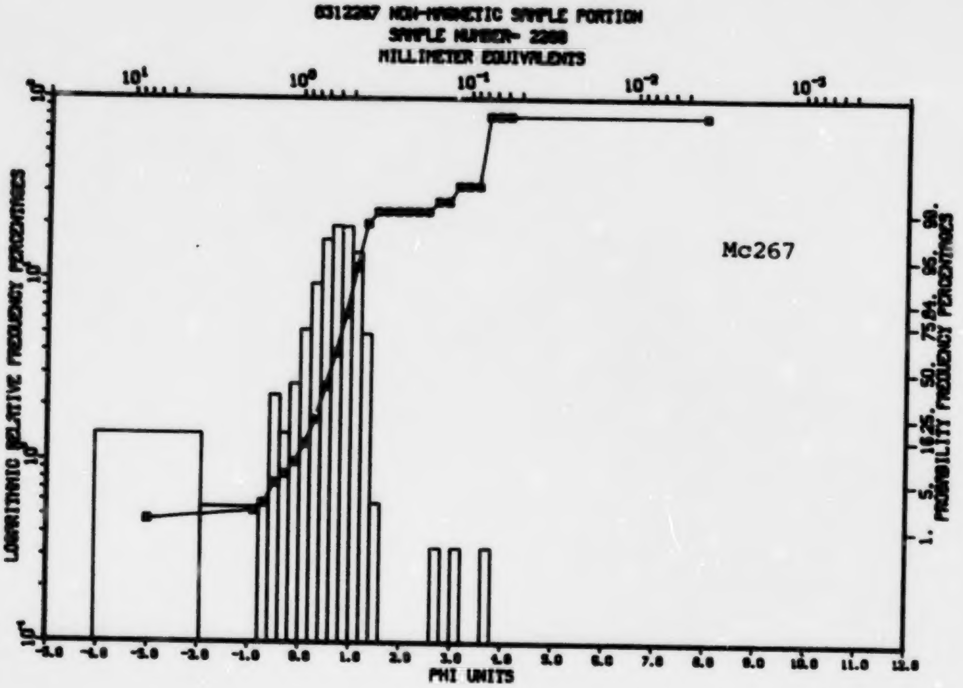
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SAMPLE NUMBER- 2288
MILLIMETER EQUIVALENTS
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10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
Mc267
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
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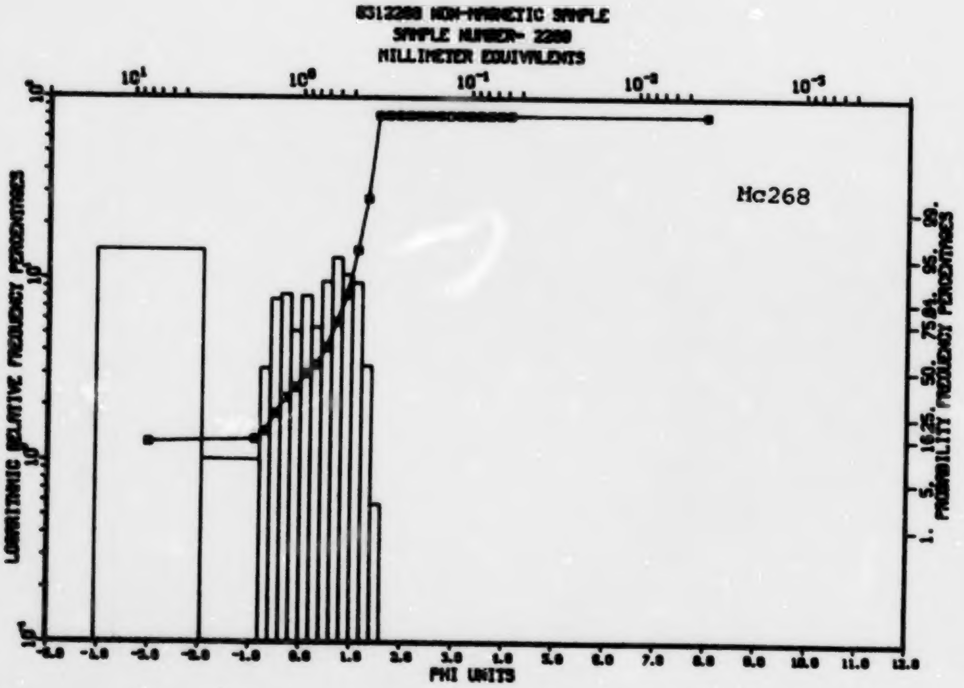
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SAMPLE NUMBER- 2288
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10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
10.25.
50.
75.84.
95.
99.
Mc268
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
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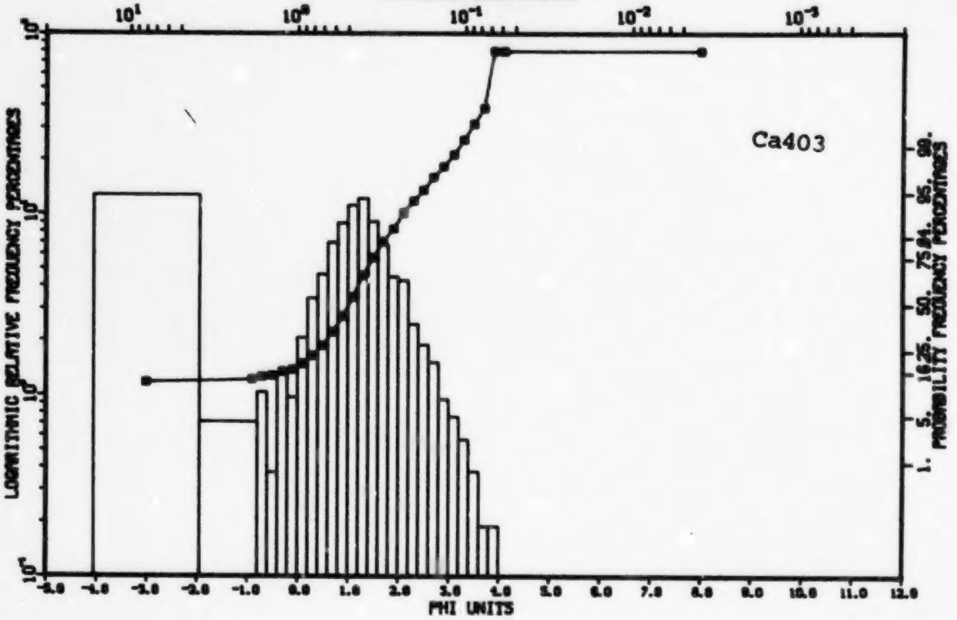
PHI UNITS



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SAMPLE NUMBER- 2207
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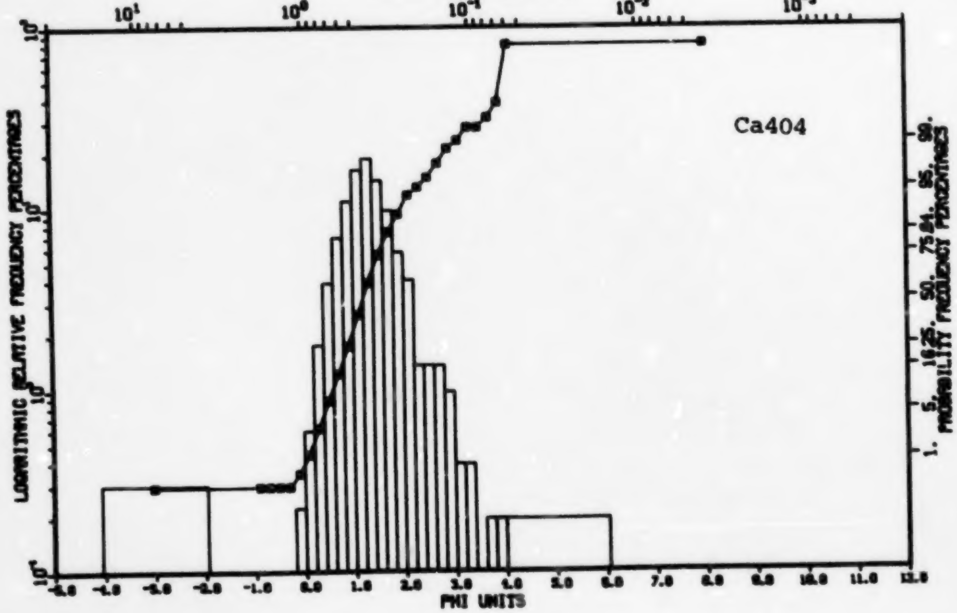

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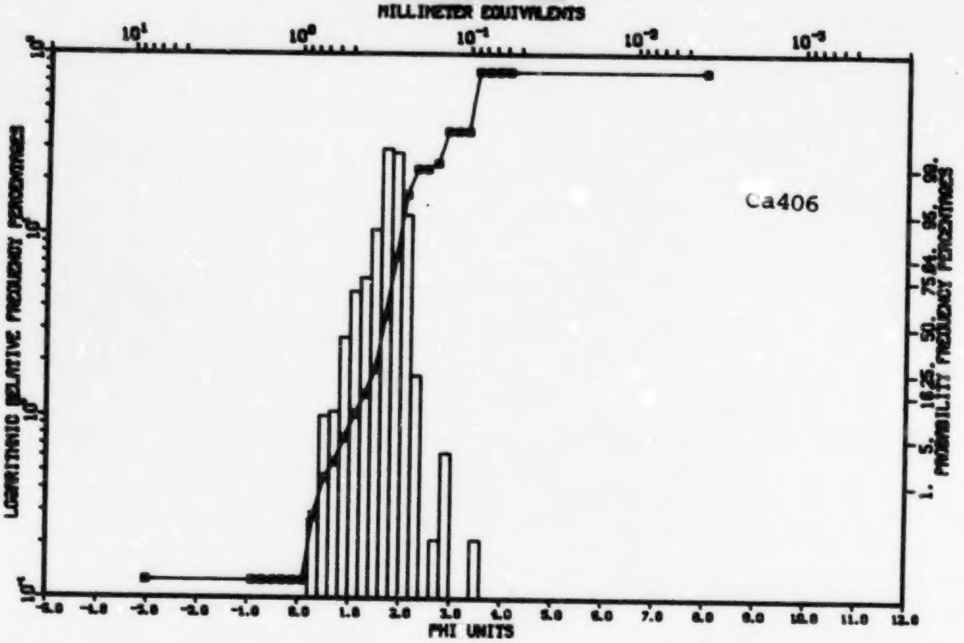
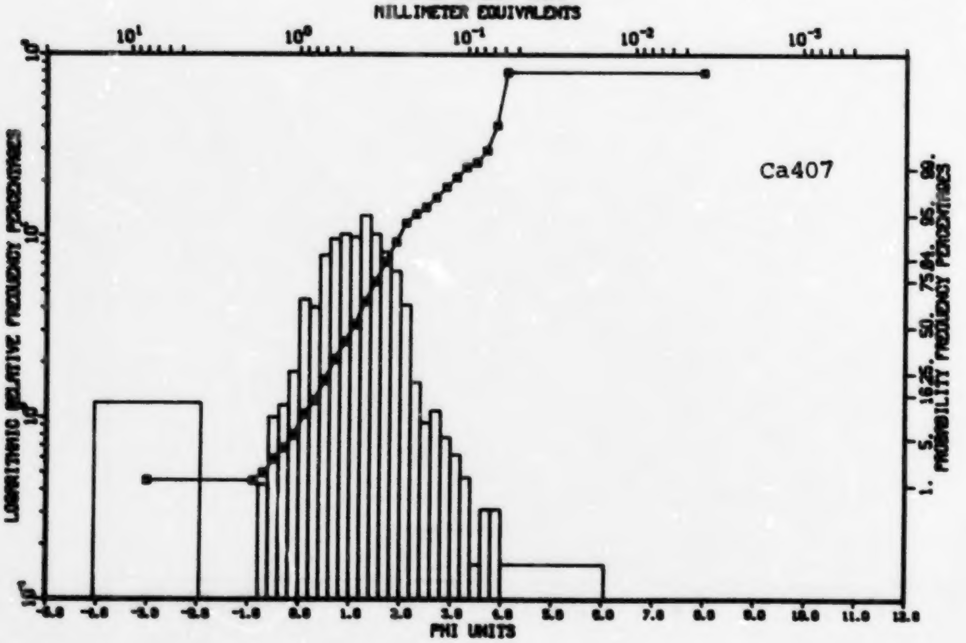
SAMPLE NUMBER- 2208
MILLIMETER EQUIVALENTS

8312406 NON-MAGNETIC SAMPLE PORTION
SAMPLE NUMBER- 2300



8312407 NON-MAGNETIC SAMPLE PORTION
SAMPLE NUMBER- 2301



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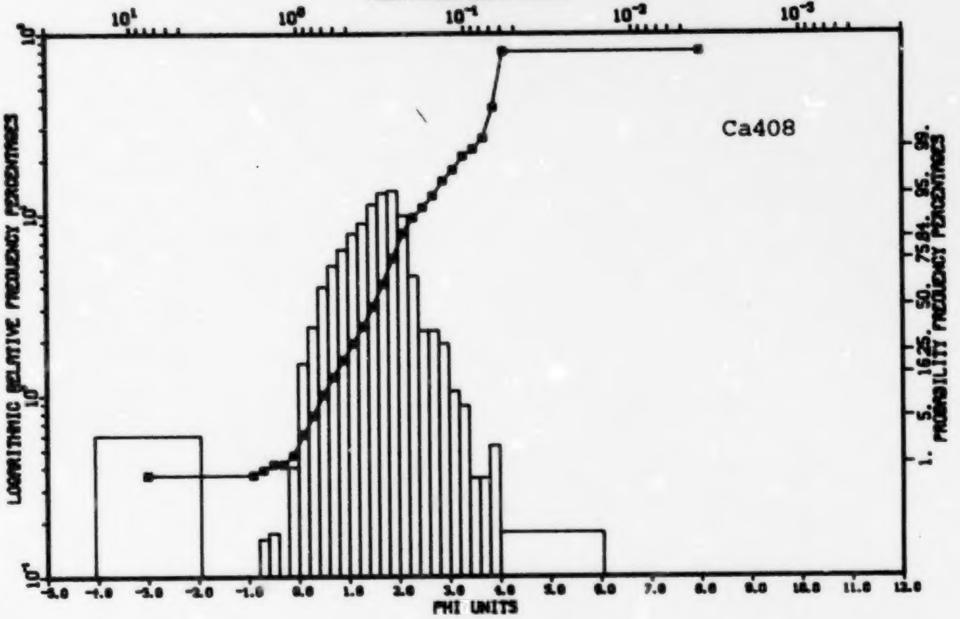
SAMPLE NUMBER- 2302



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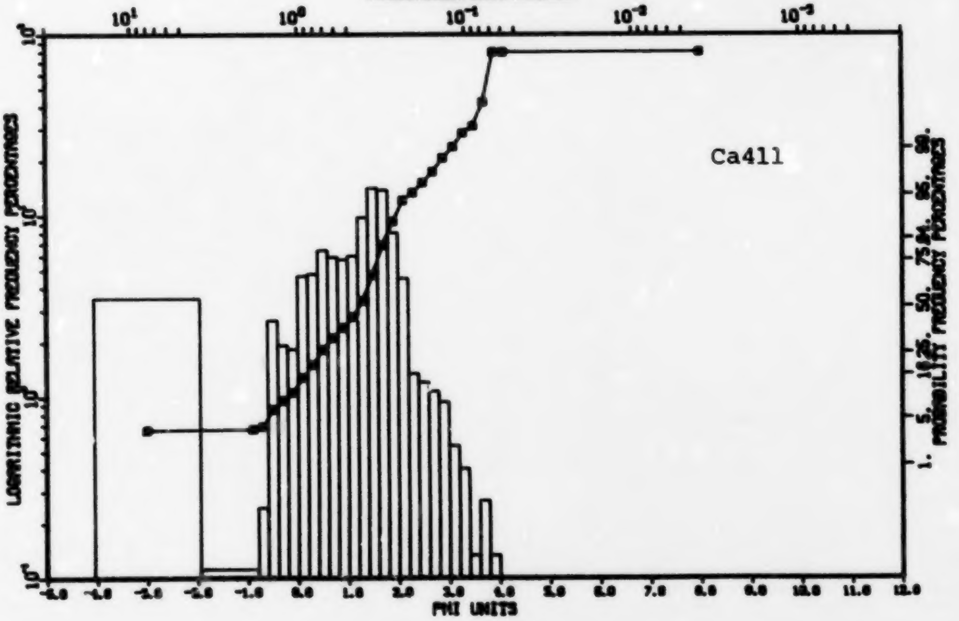
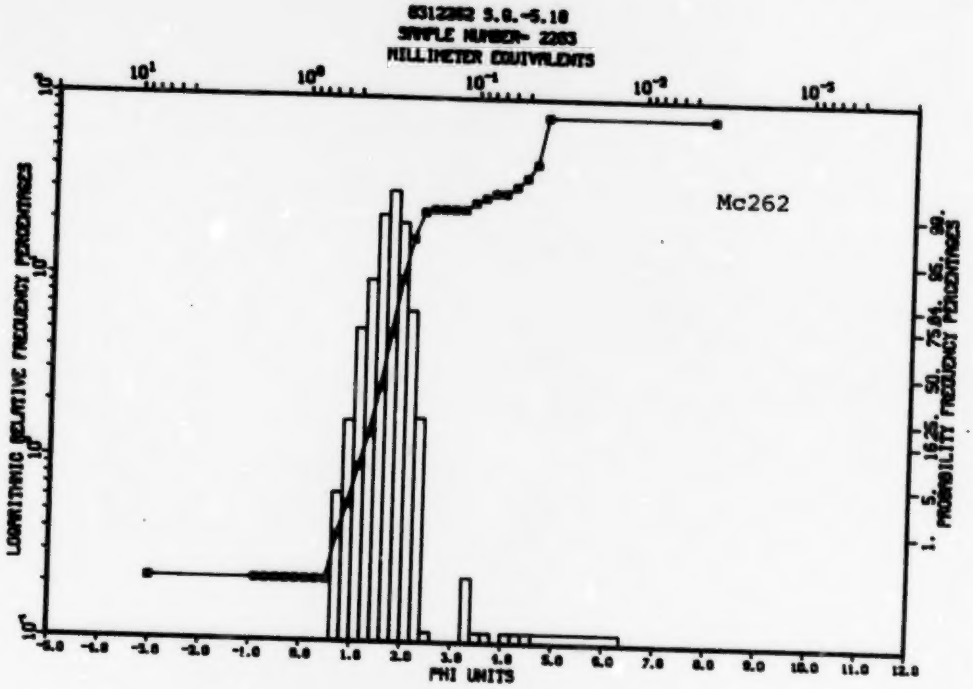
SAMPLE NUMBER- 2305




8312282 3.0.-5.10
SAMPLE NUMBER- 2283
MILLIMETER EQUIVALENTS
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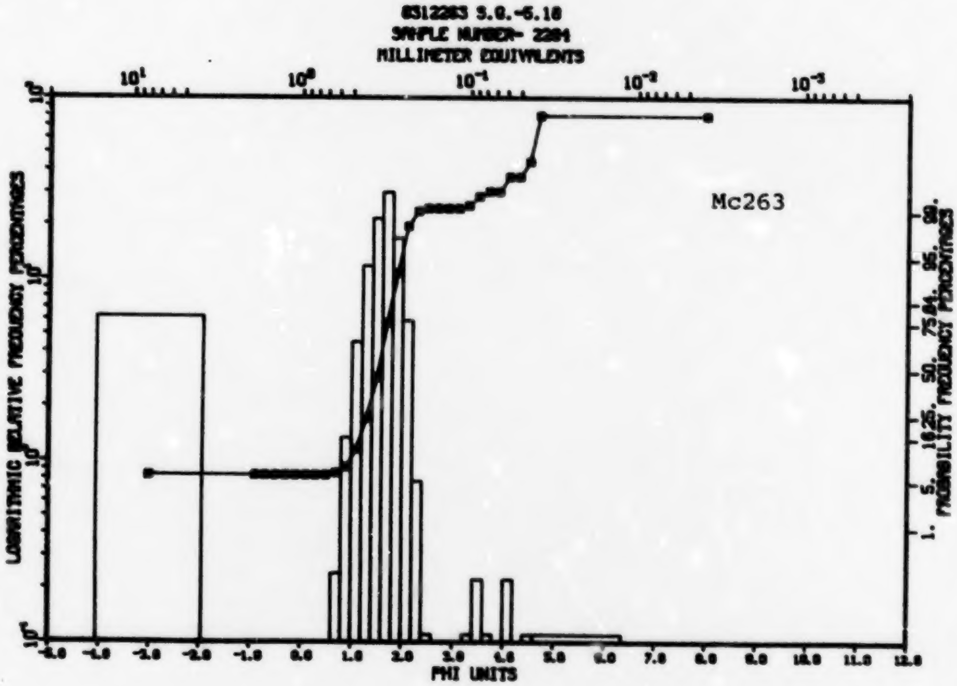
10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
Mc262
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS


8312283 3.0.-5.10
SAMPLE NUMBER- 2284
MILLIMETER EQUIVALENTS
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10^{0}
10^{-1}
10^{-2}
10^{-3}
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
Mc263
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
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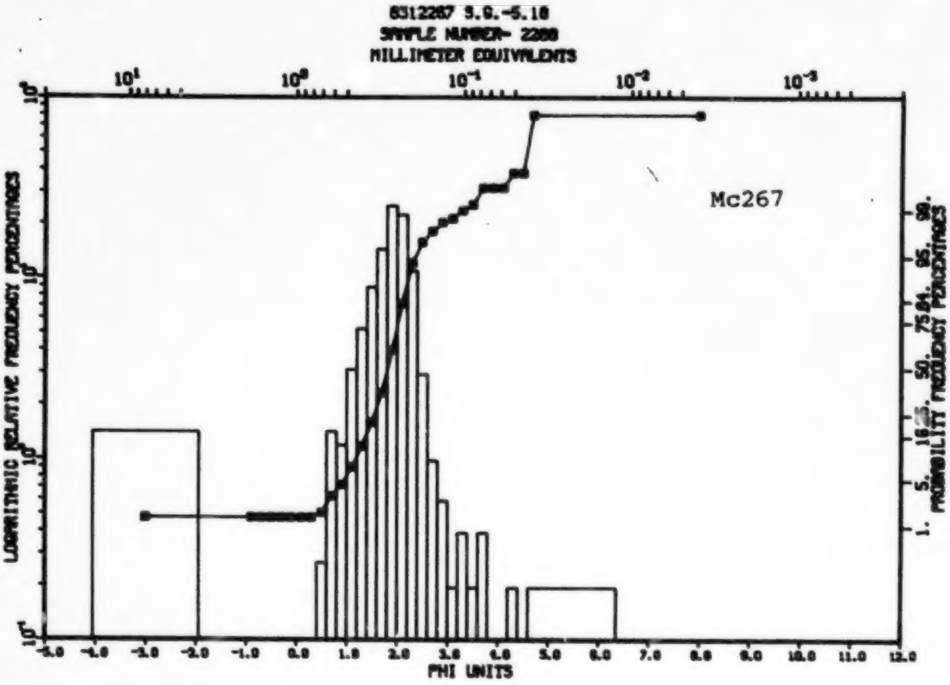
8312267 S.D.-5.18
SAMPLE NUMBER- 2268
MILLIMETER EQUIVALENTS
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10⁰
10⁻¹
10⁻²
10⁻³
Mc267
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
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5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
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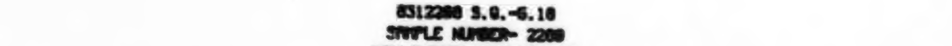
8312268 S.D.-6.18
SAMPLE NUMBER- 2269
MILLIMETER EQUIVALENTS
10¹
10⁰
10⁻¹
10⁻²
10⁻³
Mc268
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
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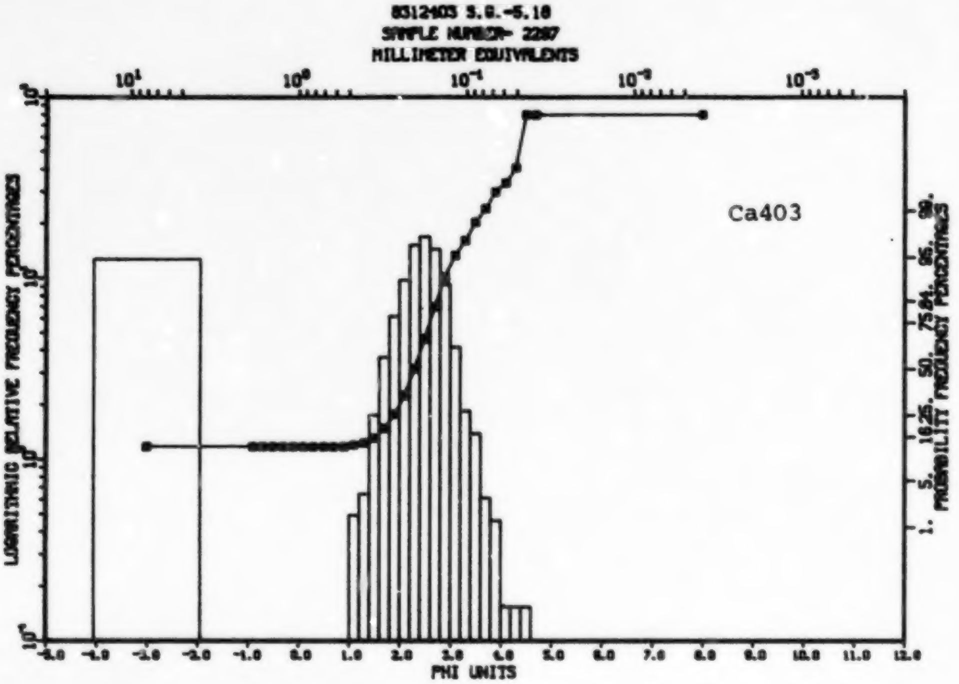
11.0
12.0
PHI UNITS


8312403 S.G.-5.18
SAMPLE NUMBER- 2287
MILLIMETER EQUIVALENTS
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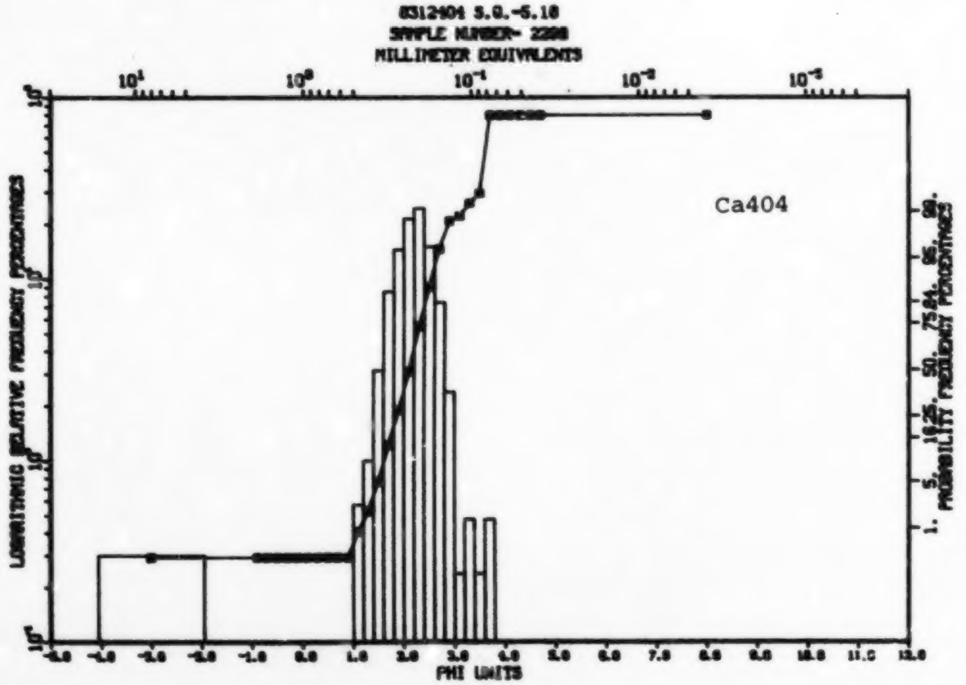
10⁰
10⁻¹
10⁻²
10⁻³
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1. 5. 10 25. 50. 75 84. 95. 99.
Ca403
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS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SAMPLE NUMBER- 2288
MILLIMETER EQUIVALENTS
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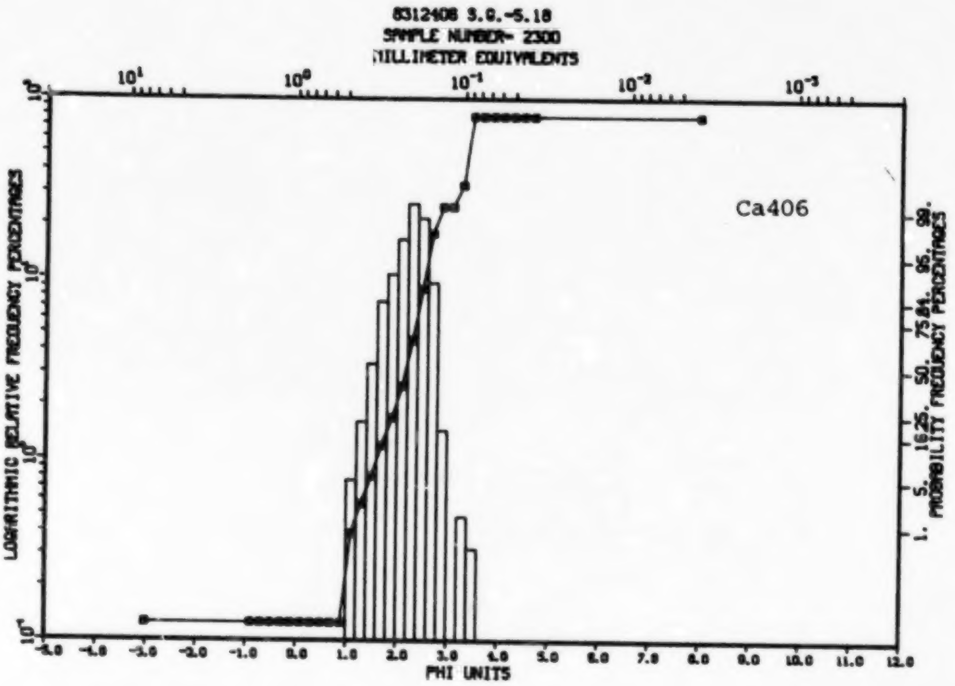
10⁰
10⁻¹
10⁻²
10⁻³
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1. 5. 10 25. 50. 75 84. 95. 99.
Ca404
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
PHI UNITS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SAMPLE NUMBER- 2300
MILLIMETER EQUIVALENTS
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10^{-1}
10^{-2}
10^{-3}
Ca406
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
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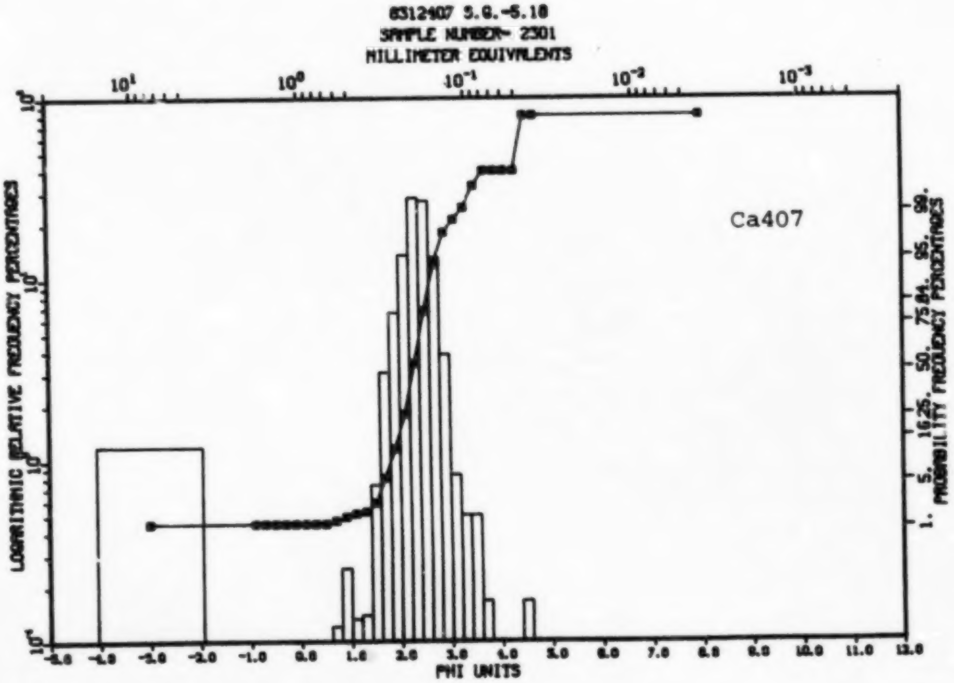
8312407 S.G.-5.18
SAMPLE NUMBER- 2301
MILLIMETER EQUIVALENTS
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Ca407
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16.25.
50.
75.84.
95.
99.
-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0
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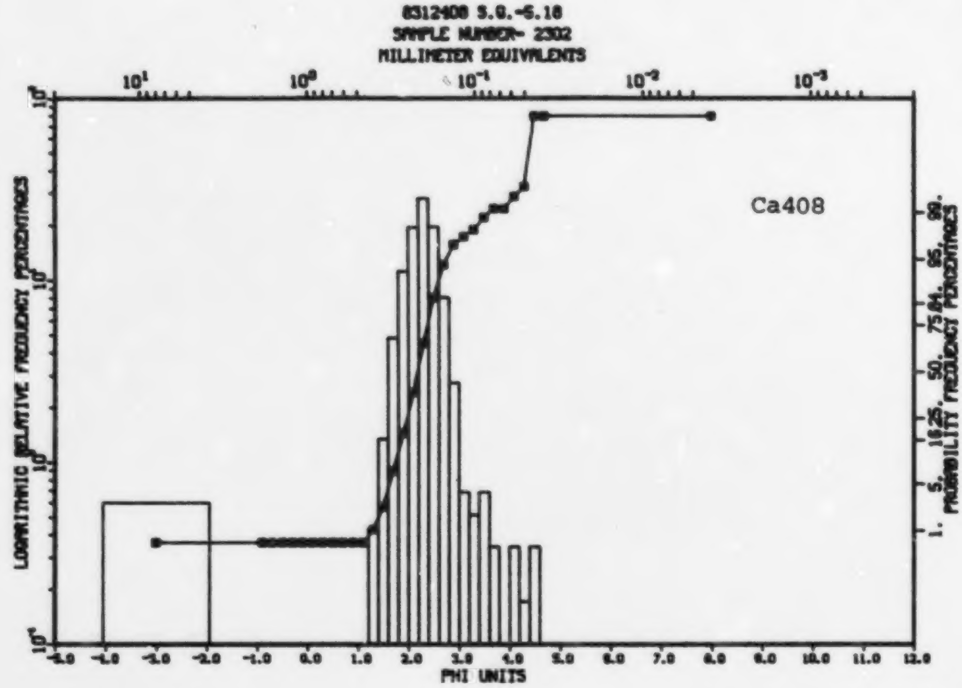
8312408 S.G.-5.18
SAMPLE NUMBER- 2302
MILLIMETER EQUIVALENTS
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10⁰
10⁻¹
10⁻²
10⁻³
Ca408
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16 25.
50.
75 84.
95.
99.
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-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
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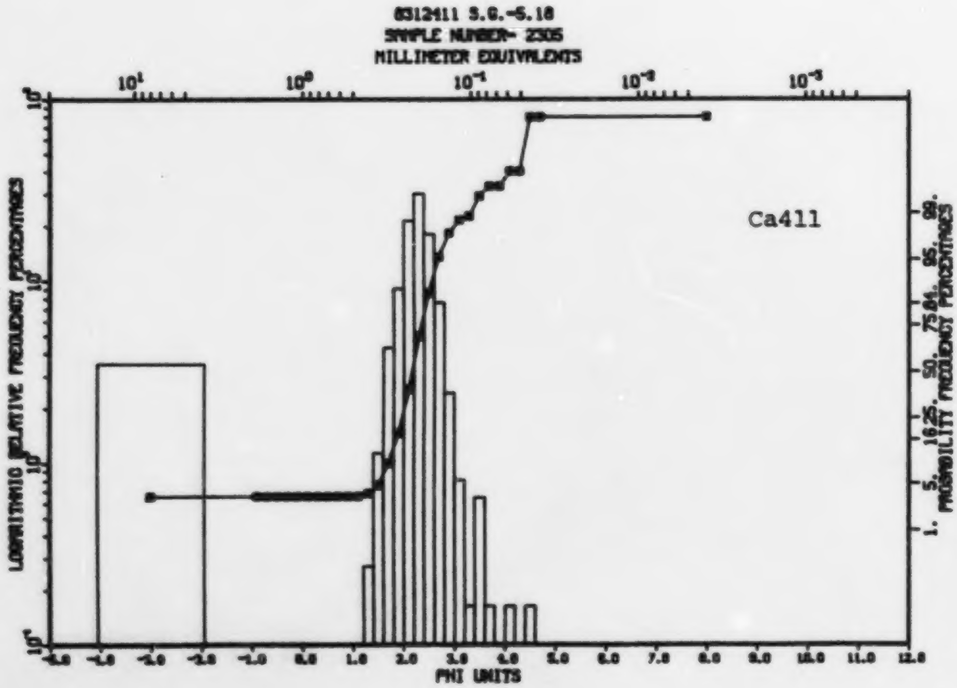
8312411 S.G.-5.18
SAMPLE NUMBER- 2305
MILLIMETER EQUIVALENTS
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10⁰
10⁻¹
10⁻²
10⁻³
Ca411
LOGARITHMIC RELATIVE FREQUENCY PERCENTAGES
PROBABILITY FREQUENCY PERCENTAGES
1.
5.
16 25.
50.
75 84.
95.
99.
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
PHI UNITS

FJORD MORPHOLOGY

by

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Objectives

1. The initial aim of the study was to provide accurate bathymetry using standard CHS navigation procedure for Cambridge, McBeth and Itirbilung Fiords;

2. To detail bathymetry in areas of scientific interest: side-entry systems, sills, ice fronts;

3. To collect limited but valuable tidal records;

4. To provide contoured bathymetric charts for these three Baffin fjords;

5. To undertake a morphometric analysis of each of these fjords.

Method

Lines running near perpendicular to the fjord axis were profiled at approximately constant speed. Between two and four fixes were located for each line through Radar triangulation. The launch track between fixes was monitored on the Radar scope. Tie-in lines along the fjord axis was undertaken for each of the three fjord axis. The CSL SHOVELLOR employed an EDO 9040, 30kHz, echo sounder.

Results

Track lines used in the morphometric analysis are given in Figures 20.1, 20.2 and 20.3. Both 1982 and 1983 survey lines are given in these figures. Bathymetric charts contoured at 50m are given in Figures 20.4, 20.5 and 20.6. Examples of different cross-section profiles are given in Figures 20.7, 20.8, 20.9, 20.10 and 20.11. Twelve morphometric parameters were measured from the sounding profiles. The parameters are defined diagrammatically (Fig 20.12) and in the accompanying figure caption. Table 12.1 lists the results for all three fjords.

McBeth Fiord has two major basins in the area of the fjord surveyed (i.e. out to 63km from the fjord-head). The inner basin has a maximum depth of 328m, divided from the outer basin by a sill of less than 163m. The sill is located around 24km from the fjord head. The outer basin has two components with maximum depths of 542m and 546m respectively divided by a rise with a depth of 516m. Basin slopes are greatest on either side of the inner sill (maximum of 5.8°). Examples of fjord cross-section profiles are given in Figures 20.8 to 20.11 and position locations on Figure 20.2. Figure 20.8A is an example of a side wall terrace, a result of a major slide removing much of the seafloor. Figure 20.8B and C are apparent seafloor channels that result from side wall slumping. Figure 20.9B is an example of a side-wall failure in the form of a slide with slide crown and toe evident. Figures 20.9A through 20.10C are four examples of a mega channel that cuts its way down to the outer basin. The channel width varies from 60 to 340m wide and 3 to 18m deep (Table 20.1). The channel is somewhat sinuous and meanders from fjord wall to fjord wall. Figure 20.11A is a typical profile where the seafloor is smooth surfaced yet inclined (in this case inclined 0.5°). Figure 20.11B is an example of a complex profile related to side-wall slumping off of both side walls.

Itirbilung Fiord has no effective sill within the area of the fjord surveyed (33km from the fjord head). The maximum depth reached is 416m. The seafloor is dissected by a series of channels that decrease in number (15 at the fjord head, 1 at the fjord mouth) and size (176m wide and 13m deep at the head, 28m wide and 1m deep at the mouth) down fjord (Table 20.1). Four cross-section profiles are provided in Figure 20.7 (positions are given in Fig. 20.1). The profiles are excellent examples of these down fjord trends in the number and size of channels.

Cambridge Fiord has one important sill, of maximum depth less than 200m, separating an inner basin (max. depth 325m) from an outer basin (675m maximum depth). The seafloor is lined with channels, the largest leading from the head of the fjord (max. depth 25m, max. width 660m).

Figure 20.13 gives the measured tide at Cambridge Fiord with the predictions from Clyde River with the following corrections: (1) minus 0.2m off of datum (Zo); (2) amplified by a factor of 1.5; (3) no time shift. Deviations from predictions were due to local wind conditions within the fjord. Figure 20.14 gives the monthly tidal signature for Cambridge Fiord for the month of September.

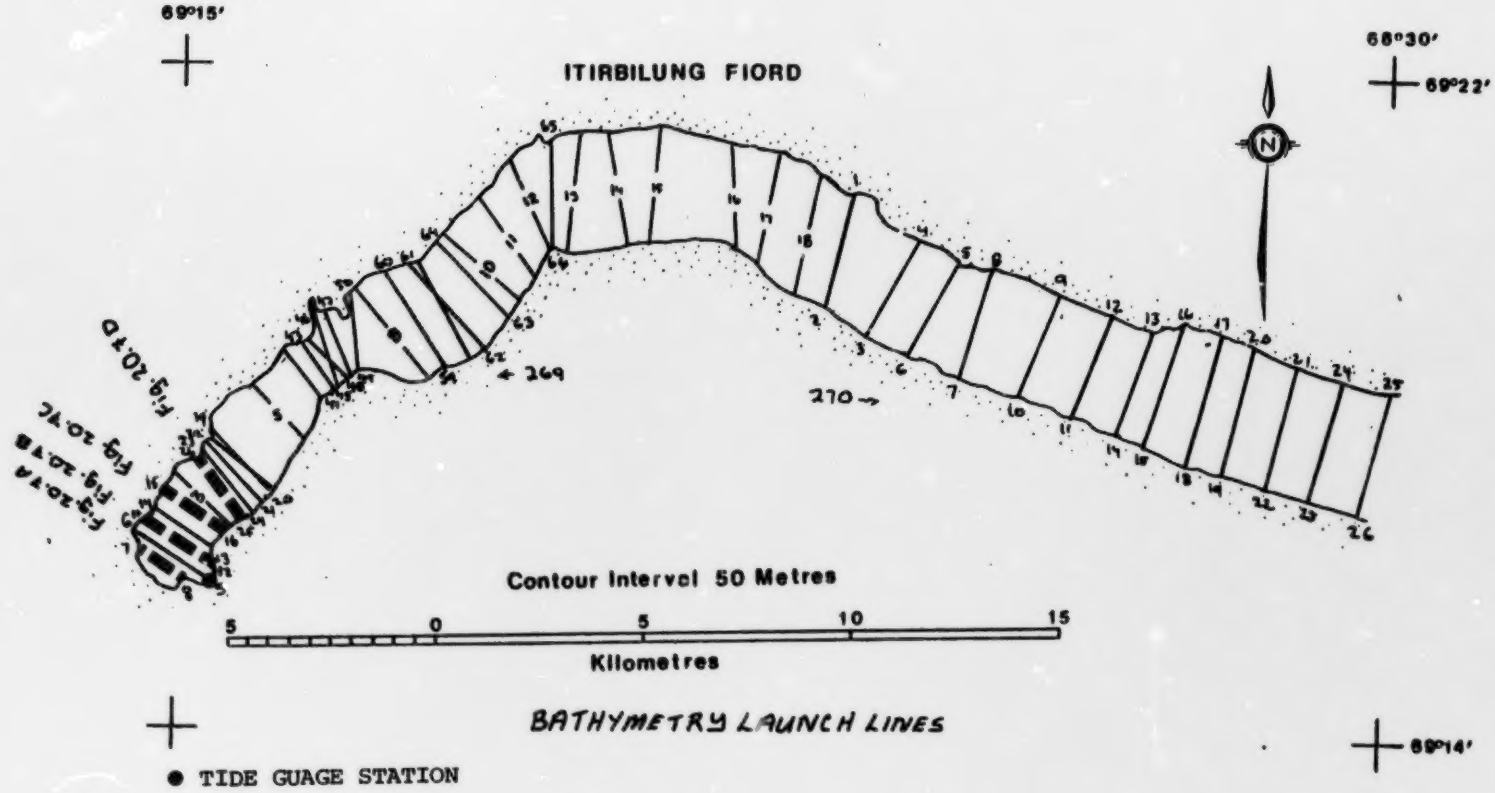
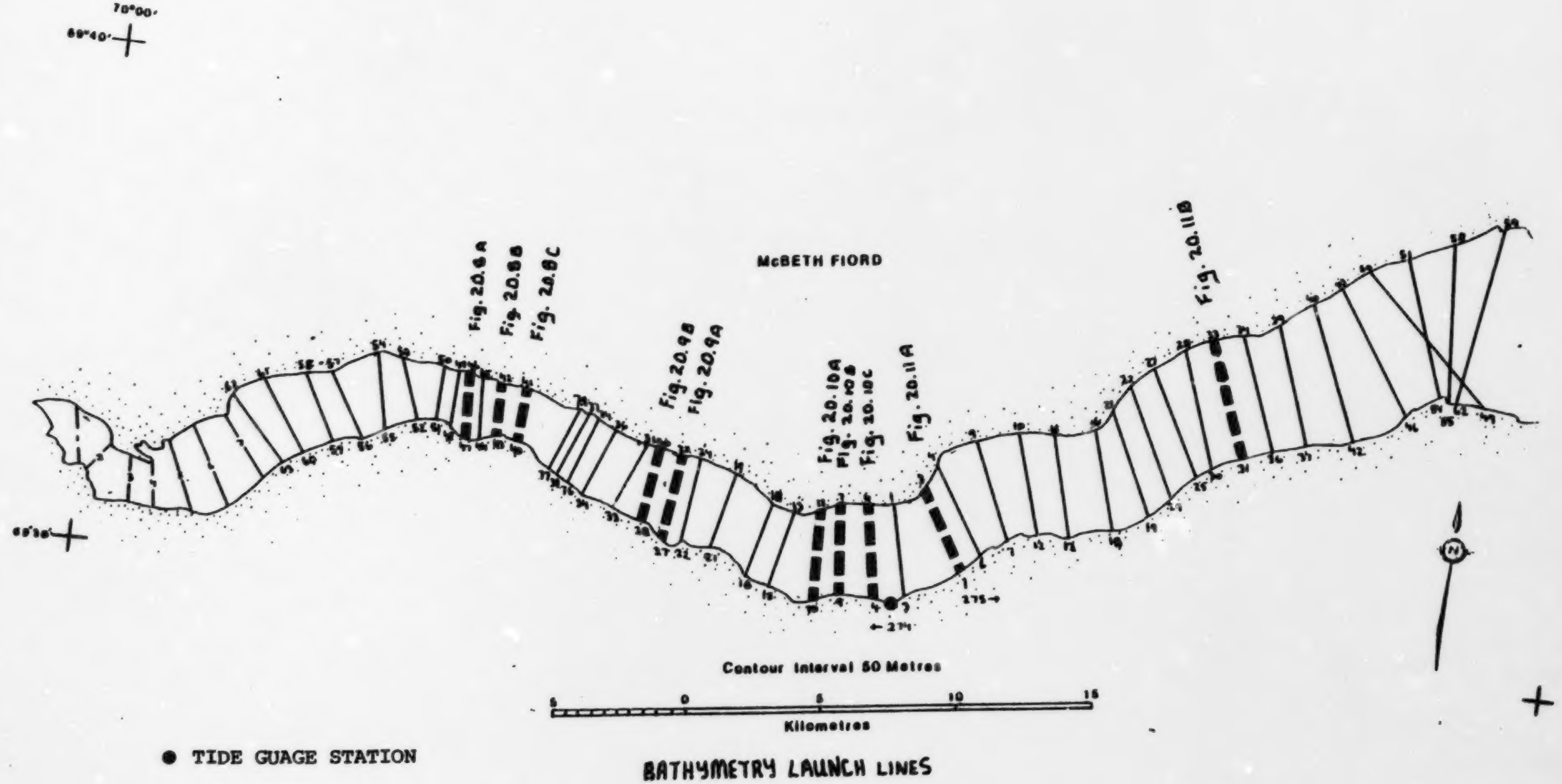
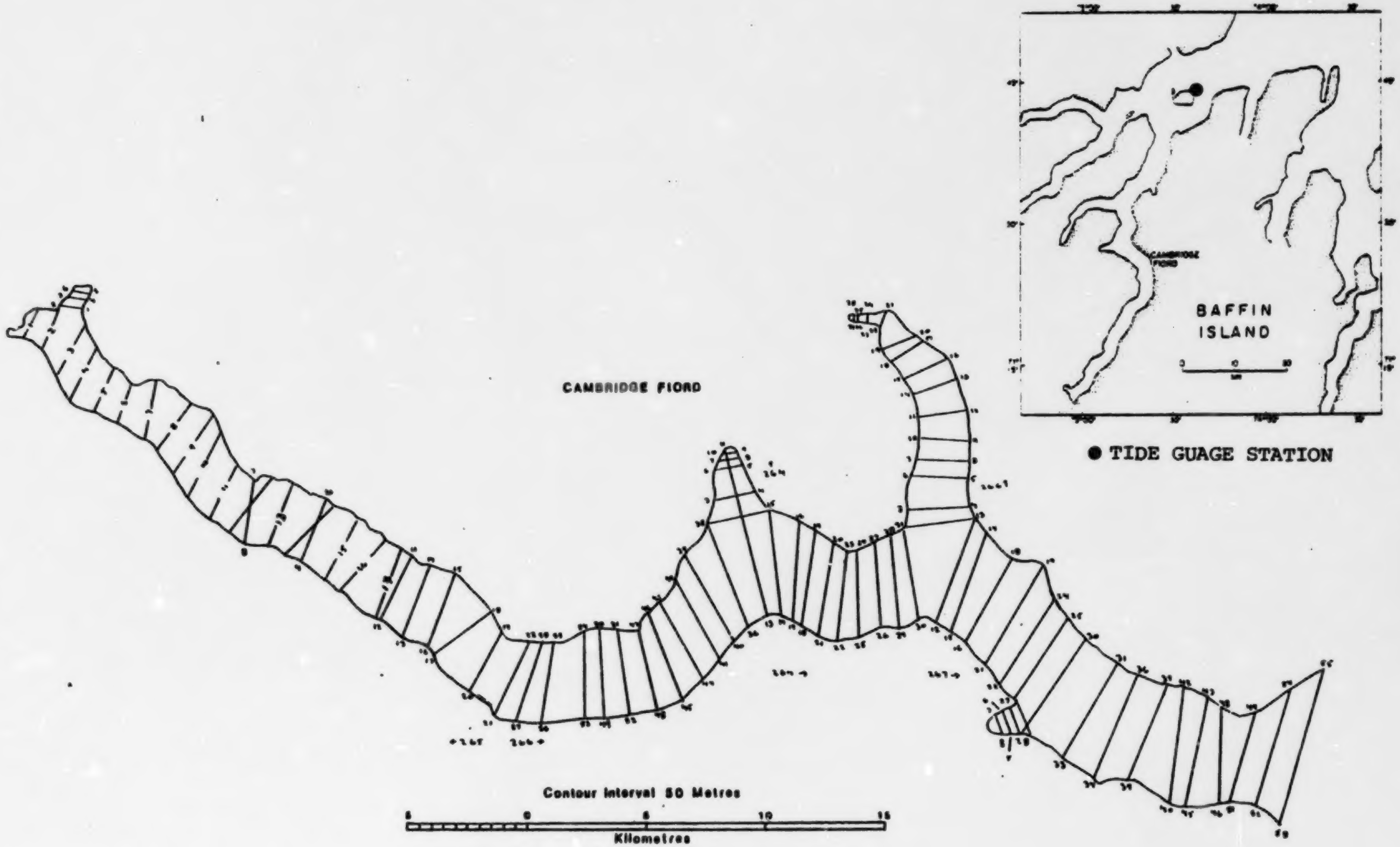

69°15'
ITIRBILUNG FIORD
68°30'
69°22'
N
Fig. 20.7A
Fig. 20.7B
Fig. 20.7C
Fig. 20.7D
← 269
270 →
Contour Interval 50 Metres
5
0
5
10
15
Kilometres
BATHYMETRY LAUNCH LINES
69°14'
● TIDE GUAGE STATION

Figure 20.1



BATHYMETRY LAUNCH LINES

Figure 20.2



BATHYMETRY LAUNCH LINES

Figure 20.3

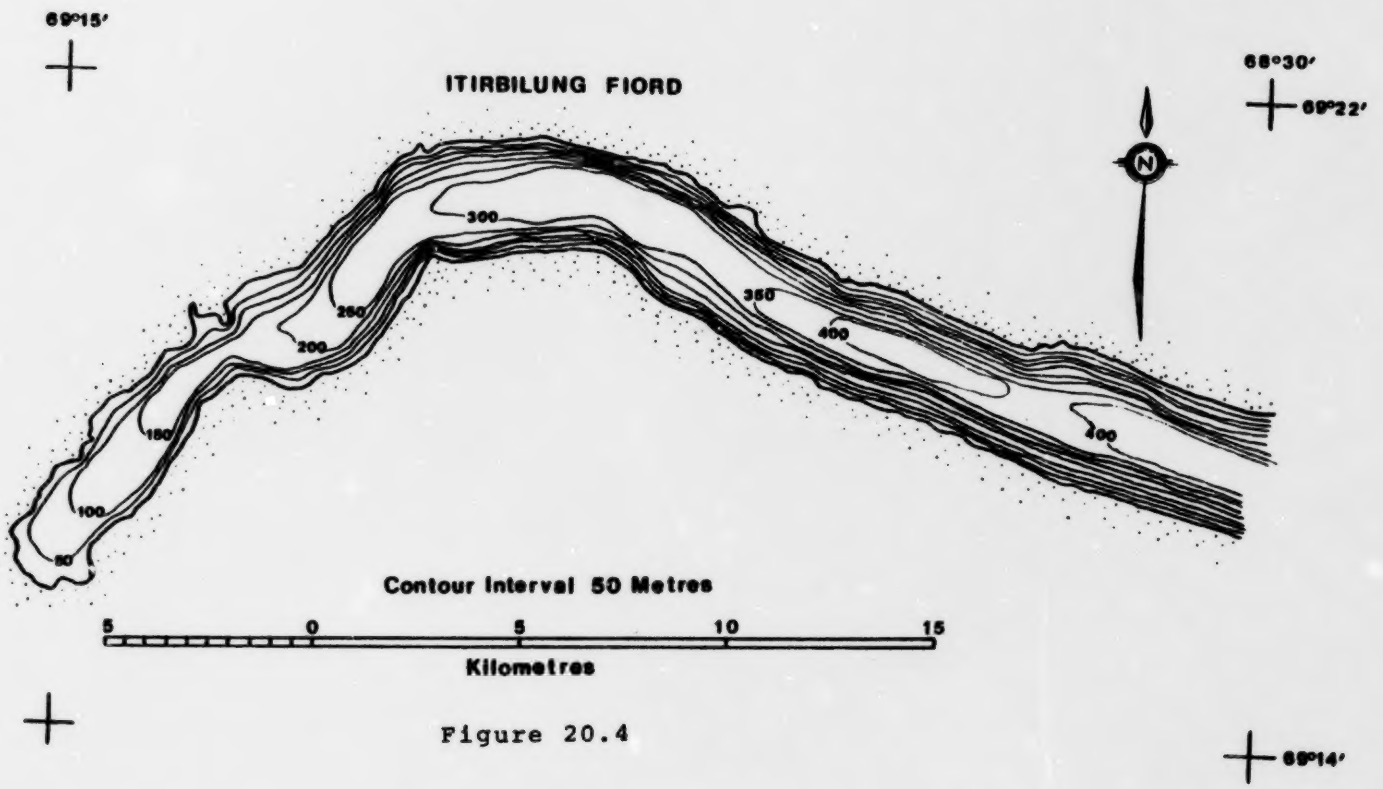

69°15'
ITIRBILUNG FIORD
68°30'
69°22'
N
300
250
200
150
100
50
350
400
400
Contour Interval 50 Metres
5
0
5
10
15
Kilometres
69°14'

Figure 20.4

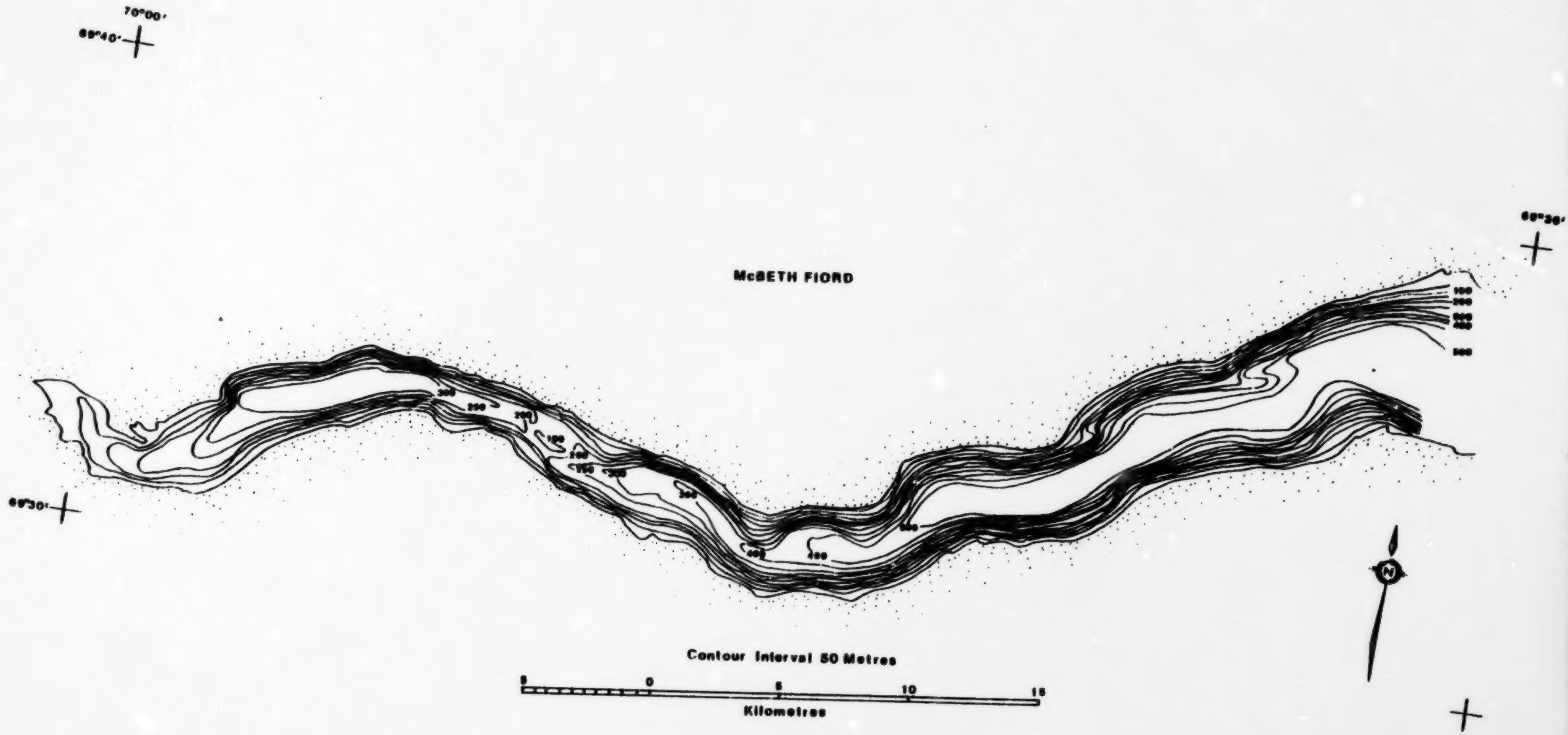

70°00'
69°40'
69°30'
69°30'
McBETH FIORD
300
200
200
100
200
150
300
300
400
400
500
100
200
300
400
500
Contour Interval 50 Metres
5
0
5
10
15
Kilometres
N

Figure 20.5

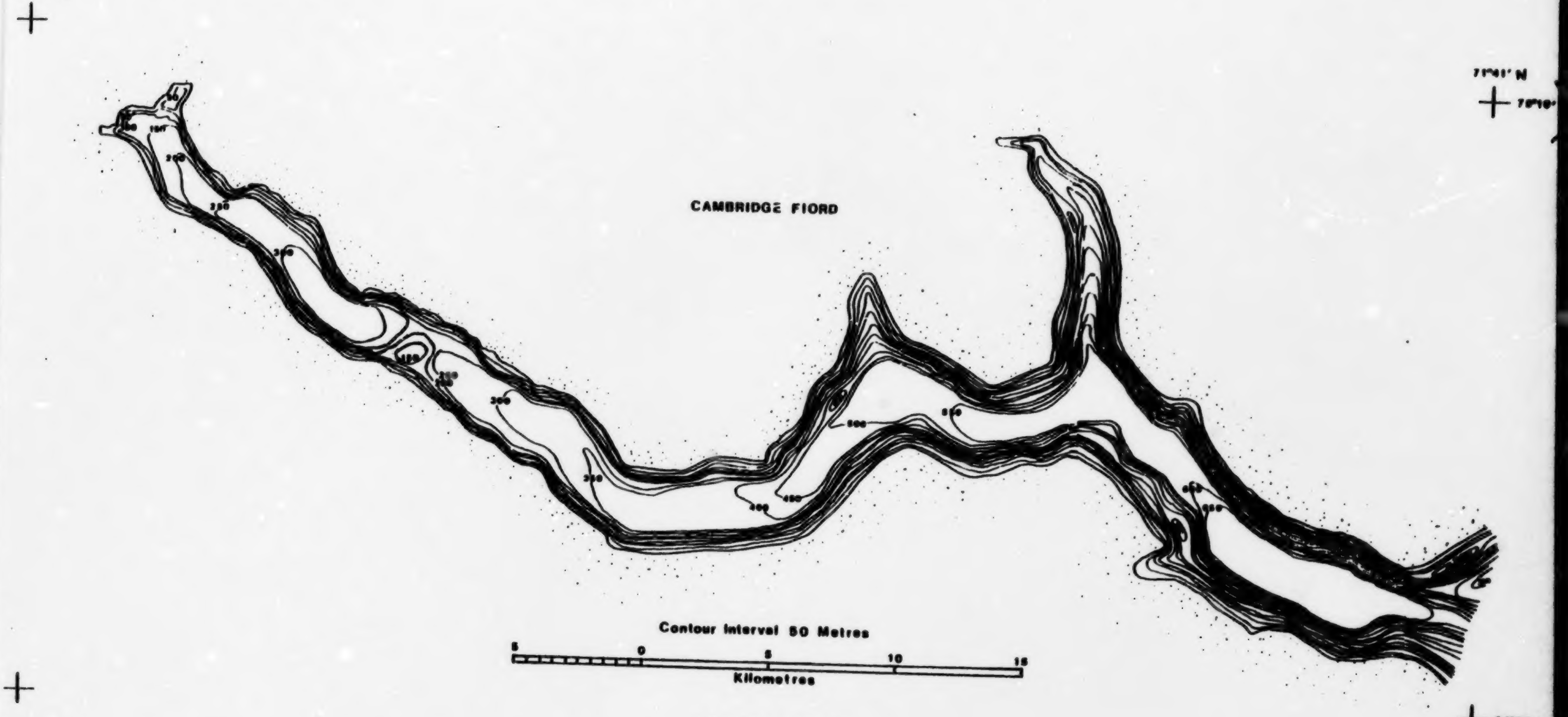
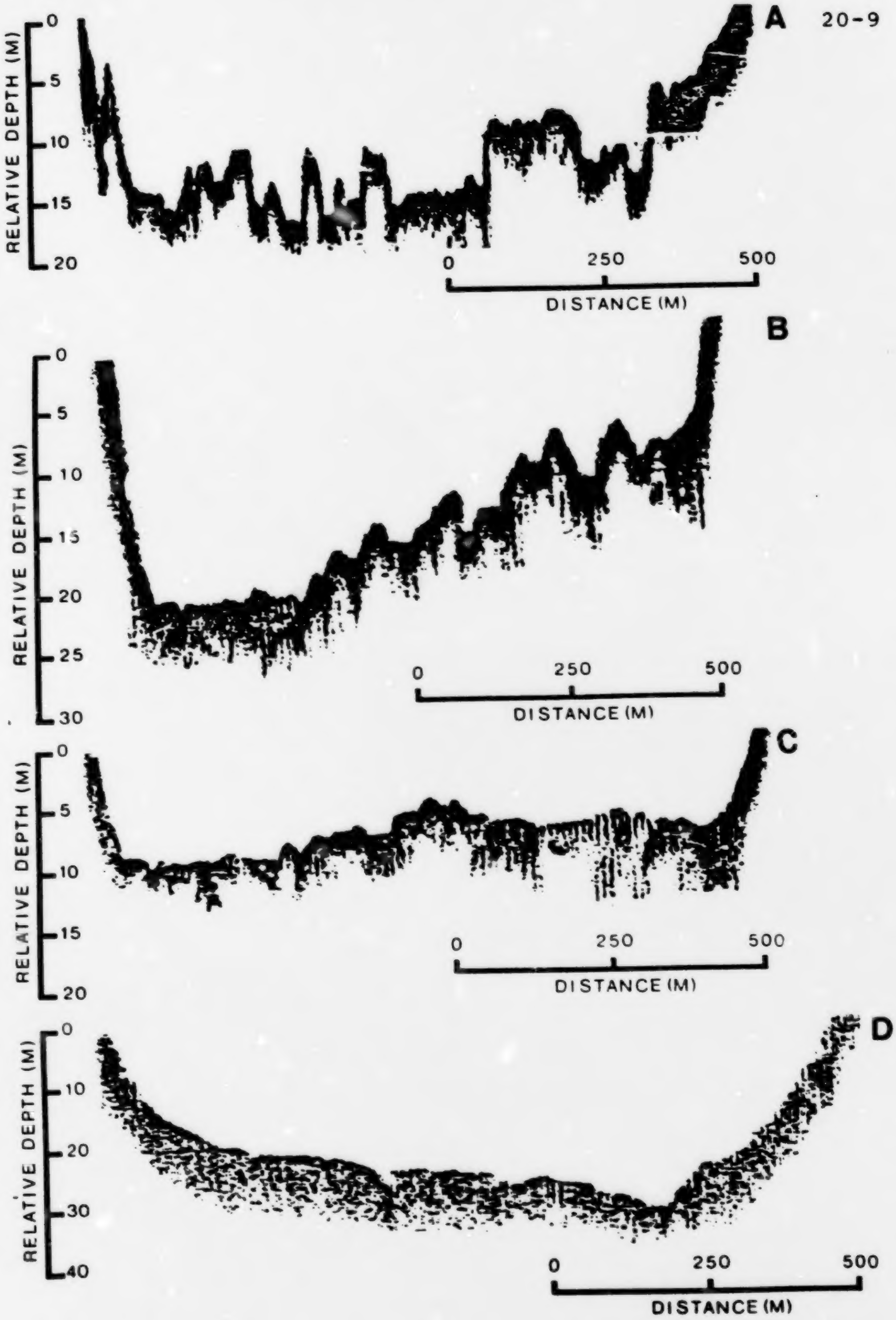

71°51' N
71°41' N
78°10'
78°20'
CAMBRIDGE FIORD
Contour Interval 50 Metres
5
0
5
10
15
Kilometres

Figure 20.6



Itirbilung Fiord

Figure 20.7

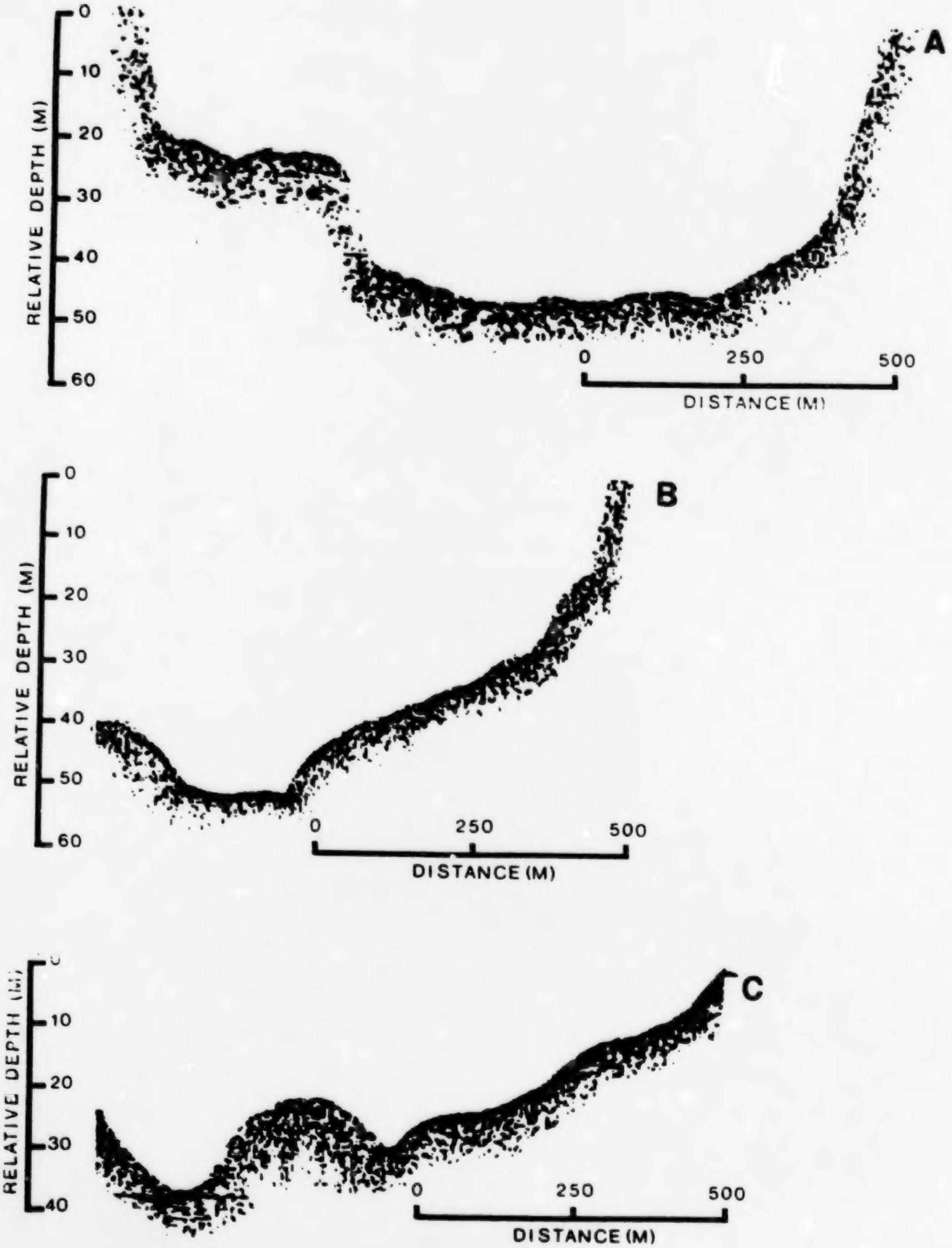
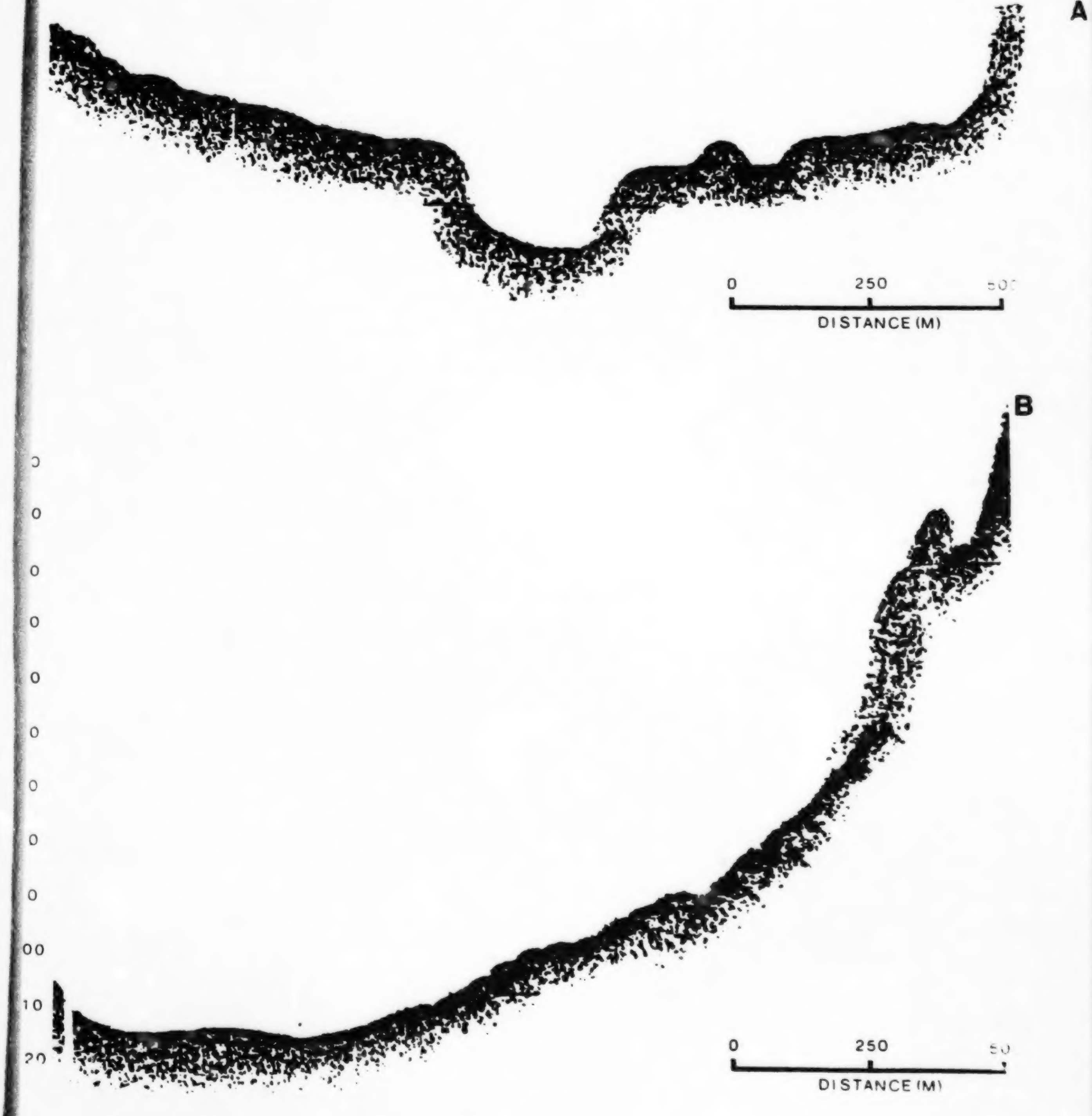


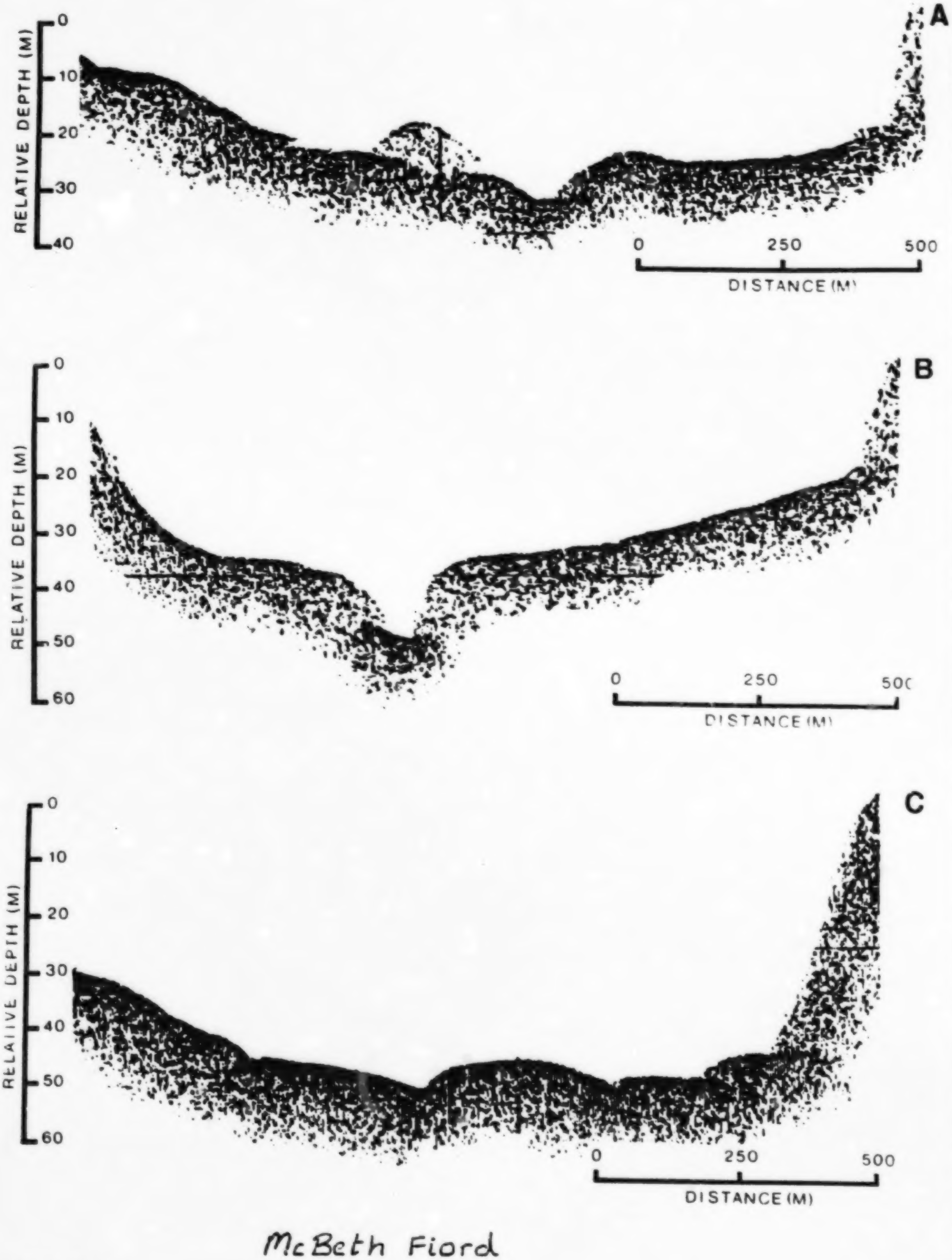
Figure 20.8

McBeth Fiord



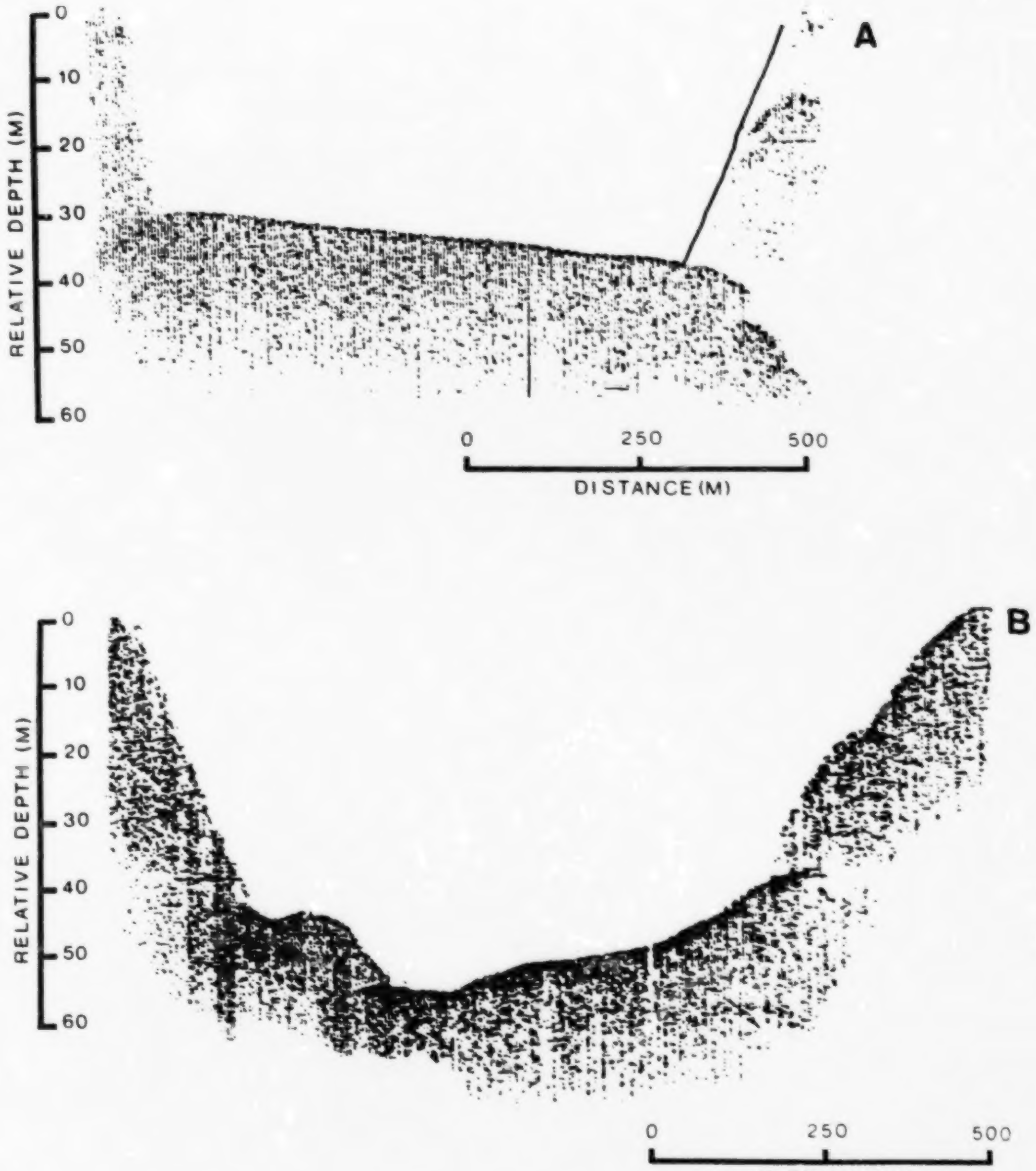
McBeth Fiord

Figure 20.9



McBeth Fiord

Figure 20.10



McBeth Fiord

Figure 20.11

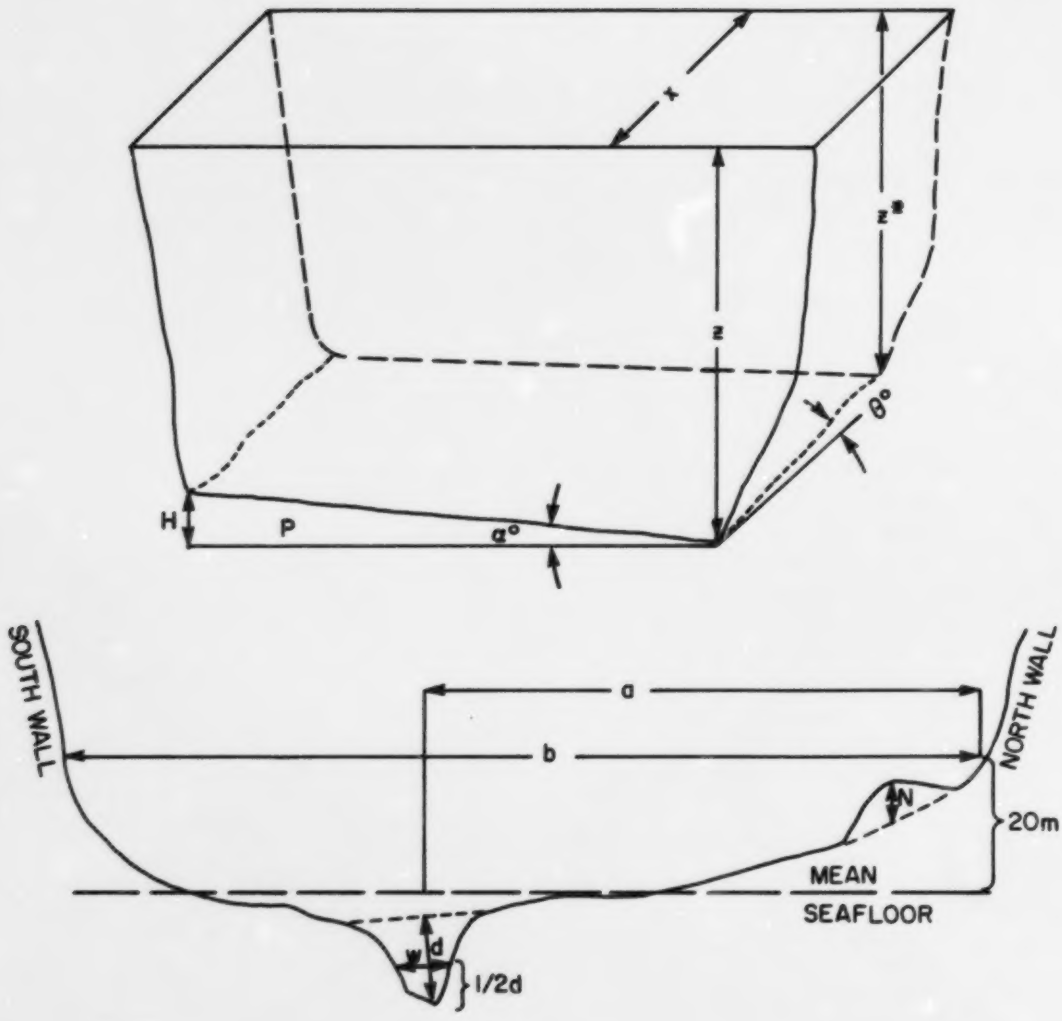


Figure 20.12

Legend of Symbols of Fjord Bottom Morphology

x	the distance down the fjord (km)
Z^*	maximum water depth (m)
θ	down-fjord seafloor slope (≈ 1 km averages) (degrees)
w	width of seafloor channel (m)
d	depth of seafloor channel from bankfull position (m)
a	distance from north wall to mid channel position measured at an elevation of 20m above mean seafloor depth (m)
b	distance from north wall to south wall measured at an elevation 20m above mean seafloor depth (m)
N	thickness height of slump pile off of north wall (m) above seafloor
S	thickness height of slump pile off of south wall (m) above seafloor
H	depth difference between south wall maximum depth and the north wall maximum depth (m)
α	wall to wall sea slope (degrees)
P	area of incline prism of sediment above Z^* (m^2)

Table 20.1

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	S (m)	N (m)	H (m)	α (°)	P (m^2)
2.0	53	-1.5			1500					
3.0	74	-1.2			600					
4.7	135	-2.1			800					
6.5	157	-0.7			800			7	0.7	2100
8.0	192	-1.3			800	10				
10.0	252	-1.7			1500	25	15			
12.5	304	-1.2			1800	30				
13.5	318	-0.8			2190	25		7	0.4	3150
14.8	327	-0.5			1600	10		5	0.2	3000
15.8	328	-0.04			1600			3	0.1	1950
17.0	328	0.00			1300		20	2	0.1	1000
18.0	327	0.05			1000	10		2	0.2	500
18.8	325	0.1			1400					
19.3	315	0.8			900					
19.7	287	1.8			1400					
20.5	250	2.5			1000					
21.2	258	-0.6	200:10	190	670	10				
22.0	231	1.5	160:15; 50:4	840; 400	940		10			
23.7	163	3.9			1400					
24.8	275	-5.8			600					
26.0	312	-1.4			700			3	?	?
27.0	328	-0.5	200:16; 70:5	930; 460	1900	2				
27.8	327	-0.07	170:3	750	1100	15				
28.5	345	-1.4	120:6	500	840	2				
29.7	371	-0.5	130:18	130	600			10	?	?
31.4	380	-1.2	150:10	100	900					
32.8	408	-1.6	175:14	310	900		30			
33.8	435	-0.8	120:6	630	1300					
34.5	450	-0.6	60:12	510	1200					
35.5	465	-1.1	340:5; 150:3	750; 300	1200					
36.5	485	-0.5			1300					
37.9	498	-0.7			1100			10	0.5	5000
38.9	510	-0.4	55:3	840	1400					
40.0	518	-0.2			1200	40		5	0.3	2500
41.2	523	-0.4			1400			4	0.2	2600
42.6	533	-0.1			1800	3		4	0.1	3400
44.0	536	-0.1			2000		10	3	0.1	3000
45.0	538	-0.2			2000	2		3.5	0.1	3500
45.7	540	-0.1			1300			9	0.4	5400
47.1	542	-0.1			1600			5	0.2	3700
48.3	540	0.1			2100		15			
49.5	536	0.2			2200					
50.9	516	0.8			1700					
52.1	522	-0.3			1600	30		5	0.2	3700
54.0	523	-0.03			1800	15		5	0.2	4200
57.0	527	-0.1			2500			?		
59.6	538	-0.3			2300	25	3	8	0.2	8800
60.7	542	-0.3			2700	10	2	5	0.1	6500
62.0	547	-0.3			2700	10	20	6	0.1	7800
63.0	546	-0.05			2300	10				

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
0.5	45	5.1	106:6	113	1325					
			42:4	226						
			49:6	324						
			56:9	395						
			28:8	465						
			42:8	522						
			56:5	635						
			56:1.5	747						
			42:3	804						
			85:1	924						
			56:5	1086						
			42:9	1170						
0.95	55	1.3	40:10	68	1264					
			91:10	148						
			17:2	266						
			23:3	319						
			35:10	370						
			23:9	421						
			23:3	467						
			35:5	524						
			23:5	558						
			80:10	672						
			92:10	775						
			46:3	888						
			51:3	957						
			57:4	1025						
			80:12	1128						
1.4	73	2.3	176:13	159	907					
			79:10	335						
			105:8	529						
			53:11	643						
			44:10	775						
1.9	85	1.4	153:2	204	1443					
			63:2	383						
			26:2	447						
			51:2	619						
			19:1	753						
			223:2	958						
			51:2	1283						
2.75	132	3.2	85:4	340	1385					
			72:2	620						
			24:2	863						
3.0	133	0.23	94:3	297	1115			12	0.8	5126
			26:2	677						
			10:3	792						
3.25	138	1.2	168:3	292	1225			10	0.6	4777
			34:2	686						
			22:3	815						

Itirbilung 2/

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
3.5	145	1.6	57:1	498	1509			12	0.6	7008
			43:1.5	662						
			21:1	812						
			57:2	1047						
5.0	157	0.46			1090	12.5				
6.4	163	0.23			?		2			
6.65	161	-0.46			519					
7.0	160	-0.16	98:7	351	506	2	2			
7.5	164	0.46	64:5	306	369					
9.0	235	2.7	159:5	?	?					
			159:7	?						
			159:10	?						
			159:12	?						
9.9	248	0.83	123:2	417	1031					
			98:2	700						
10.75	261	0.88	161:3	347	1584	2				
			173:3	1262						
12.5	300	1.28	46:5	227	1114					
			159:2.5	455						
13.0	305	0.29	480:5	380	1480			7	0.3	4200
			440:3	1200						
14.0	325	1.43	246:5	205	1067	2		15	1.0	6465
15.0	330	0.29	200:4	140	1321			7.5	0.4	4505
17.0	340	0.29			984	1				
18.0	345	0.29	668:30	?	?					
19.0	310	-2.0			1445		5			
19.9	333	1.46			1004		7	27	1.4	14800
21.5	378	1.84	453:7	302	1458		4	7	0.3	4550
22.5	398	1.43	116:2	594	1071			9	0.6	4033
23.5	402	0.23			?					
25.0	403	0.03	452:2	375	1113			6	0.4	2910
26.3	402	-0.04	296:2	632	1123	1				
27.3	399	-0.17	91:2	238	1302					
			23:1	832						
			23:1	991						
28.0	392	-0.57	22:1	205	1311		2			
			33:1	300						
			28:1.5	406						
			11:0.5	578						
			33:1	661						
29.0	401	0.52	23:0.5	109	1522					
			57:2	246						
			29:1	378						
			23:0.5	652						
			34:1	1007						
			46:1	1138						
			34:1	1287						
			80:3	1141						

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Itirbilung 3/3

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
29.85	411	0.67	245:8	245	1394					
			22:0.5	602						
			11:0.5	892						
			28:1	987						
			45:2	1104						
			56:4	1215						
30.85	415	0.23	23:0.5	931	1421			12	0.6	6836
			23:0.5	1184						
32.0	413	-0.1	33:1	141	1370					
33.3	416	0.17	28:1	250	1444			14	0.65	7400

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
0.5	67.5	7.7	86:10	86	1475					
			129:10	386						
			129:8	600						
			129:5	1200						
			214:15	1371						
1.5	145	4.4	555:20							
2.5	193	2.8	660:20	849	1933			15	0.45	14151
3.5	218	1.4	456:25	397	1706					
4.5	238	1.2	189:23	151	1208			5	0.26	1905
5.5	260	1.3	112:20	75	819					
			335:2	558						
6.5	275	0.9	39:5	77	1423	2		7.5	0.32	5048
7.5	295	1.2	231:1	736	1231					
8.5	315	1.2			1254	5		4	0.21	2239
9.5	320	0.29	85:2	782	1352			7.5	0.35	4595
10.5	325	0.29			1270				0	
11.5	220	−6.0	47:5	−283	1064	8				
			402:23	307						
			355:29	851						
14.5	200	−0.38	201:7	268	1252					
			89:5	503						
			89:5	626						
			45:9	1520						
			89:5	1655						
			268:28	2035						
			827:42	704						
16	260	2.3	38:4	401	1794		5	10	0.28	10303
			76:5	572						
			115:4	897						
			76:4	1221						
			38:3	1564						
			95:5	1679						
17	290	1.72	77:5	77	1534			20	0.79	14577
			96:3	633						
			77:2	748						
			77:2	902						
			96:2	1093						
18.5	308	0.69	38:1	331	1729		3	10	0.34	8452
			78:5	1055						
			51:1	1246						
19.5	318	0.57	108:3	?	?					
			94:2	?						
			40:1.5	?						
20.5	327	0.52	26:1	620	1640		5	14	0.49	11387
			39:1	865						
			32:1	1394						
21.5	353	1.5	52:3	360	1716		8	46	1.32	46100
			52:1	806						

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
			66:1	1133						
			39:0.5	1356						
			92:2	1395						
23	364	0.42	169:20	85	1430	4				
			26:1	572						
			33:1	865						
			78:2	1203						
			65:1.5	1365						
24	364	0	688:3	531	1875	10		13	0.45	10847
			25:5	1506						
24.5	370	0.69	83:3	152	2448		1.5			
			28:0.5	602						
			28:0.5	816						
			83:1	1611						
			28:1	2109						
			28:1	2247						
			42:1.5	2393						
25	375	0.29	659:2	471						
			31:2	2308						
26.5	378	0.12	58:2	?	?					
			47:1.5	?						
			12:1	?						
			12:0.5	?						
			23:0.5	?						
27	390	1.38	213:3	279	1596	10;10		10	0.38	7581
28	431	1.20	81:2	?	?					
			27:1	?						
			27:1	?						
			108:4	?						
29	450	1.09	67:2	215	1637					
			40:1	588						
			13:1	750						
			27:1	875						
			13:0.5	919						
			81:2	1025						
			94:3	1263						
			67:2	1625						
30	466	0.92	38:0.5	375	1531			33	1.06	29494
			25:0.5	1125						
			31:0.5	1463						
			50:1	1675						
31	480	0.80	92:4	198	1478			33	0.97	32017
			79:2	818						
			40:2	1135						
			26:1	1260						
			53:2	1445						
			158:2.5	1703						
			86:2.5	2026						

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
32	490	0.57		1563		5				
33	508	1.03	40:0.5	47	1086			25	1.0	18079
			93:2	1886						
			107:2	2173						
34	519	0.63	80:2	160	2210		5			
			133:3	1372						
35	533	0.80	59:0.5	532	4398		3	10	0.15	18734
			39:0.5	947						
36	540	0.40			2010			4	0.29	9856
37	544	0.23			2075			3	0.09	2909
37.5	545	0.12	64:2	1656	1772		11	10	0.34	8346
38	548	0.34	59:1	?	?					
			64:1	?						
38.5	550	0.23			1831	15		3	0.11	2370
39	553	0.34	243:3	486	1798			0	0	
40	565	0.69	38:1	190	1306			16	0.71	10347
			25:0.5	355						
			101:1.5	1116						
40.5	574	1.03	72:3	93	1091			9	0.51	4556
			57:2	1048						
41	583	1.03	31:0.5	1082	1351		20	3	0.13	1936
43	584	0.06	36:0.5	1930	2151		15	4	0.11	4278
43.5	596	1.38	37:1	309	1311		10			
			76:2	460						
			202:4	870						
44.5	590	−0.34	621:1.5	268	2235			10	0.26	11110
			52:1	1281						
			63:1.5	1568						
			222:1	1908						
45.5	590	0			2082			3	0.08	3079
46.5	591	0.06			1258	3				
47.5	635	2.52			?		7.5			
48.5	650	0.86	91:2	964	?					
			52:2	2254						
50	670	0.76	48:1	357	?			20	0.50	22986
51	670	0	61:1	405	?					
52	673	0.17			?					
53	673	0			?					
53.5	675	0.23			?			7.5	0.18	8919
54.5	675	0	109:7.5	157	?					
55.5	670	−0.29			?					
56.5	650	−1.15	120:15	108	?					

Side Entry 1

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
0.25	49	21.4	24:2.5	?	?			12.5	1.42	3146
			10:0.5	?						
			24:1	?						

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
			24:2	?						
			17:3	?						
			14:1.5	?						
			7:1.5	?						
			31:3	?						
0.50	54	1.15	22:1	160	496	5				
			28:1	237						
			22:0.5	287						
			22:1	336						
			33:0.5	392						
0.75	56	0.46	66:5	66	620	9				
			58:13	145						
			74:11	186						
			50:13	388						
			33:5	475						
			25:3	525						
			25:3	570						

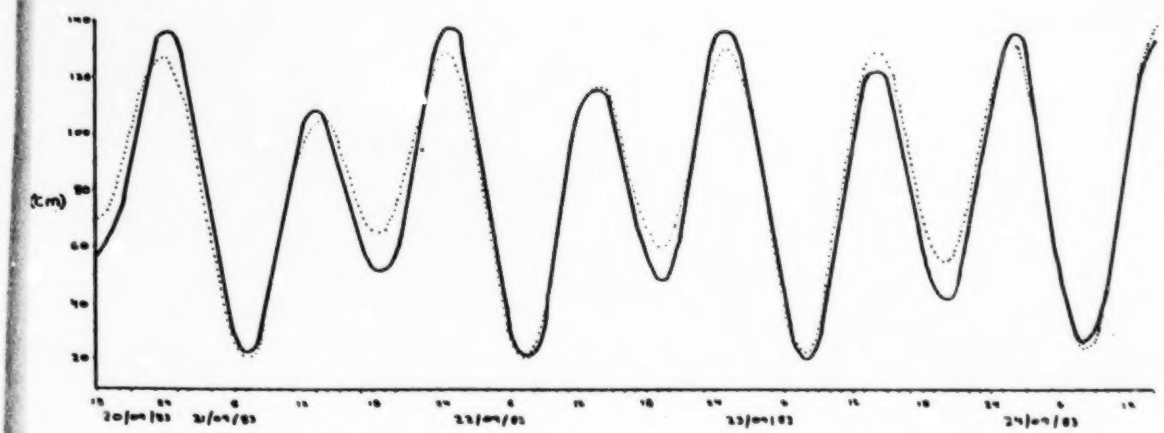
Side Entry 2

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
0.25	31	7.07	15:2	?	?	2				
			61:5	?						
			31:2	?						
			15:1	?						
			15:1.5	?						
			92:8	?						
			46:2	?						
0.5	45	1.60	305:22	237	458		2			
			53:1	548						
			53:1	611						
0.8	141	17.75	84:3	73	345		10			
			42:2	141						
			42:3	199						
			282:33	209						
			105:5	282						
2	222	3.86	124:4	?	?					
2.95	303	4.87	19:1	104	378	4	3			
			94:6	194						
			312:28	198						

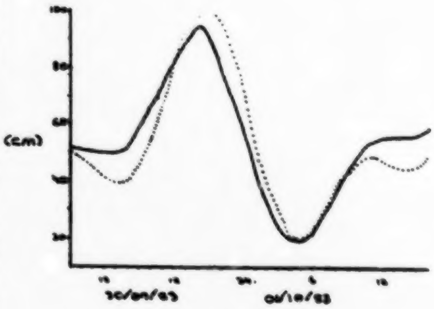
Side Entry 3

X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
0.2	21	11.59	38:6	?	?	2				
			21:2	?						
			58:4	?						
			17:1	?						
0.3	13.5	-4.29	48:8	?	?					
			90:8	?						

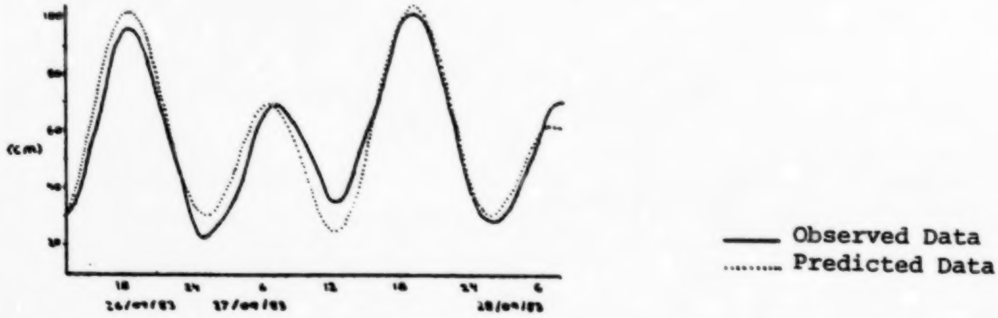
X (km)	Z* (m)	θ (°)	W:d (m)	a (m)	b (m)	N (m)	S (m)	H (m)	α (°)	P (m^2)
0.75	36	2.86	20:1	66	287					
			24:0.5	110						
			15:3	180						
			10:1	231						
1.4	130	8.23	23:1	94	425			3	0.56	462
			23:1.5	154						
			34:0.5	214						
			57:1	308						
2.4	161	1.78	266:13	304	587		3			
			100:4	354						
2.9	178	1.60	80:3	120	638			12	1.48	2791
3.9	203	1.43	365:18	342	980					
4.9	234	1.78	184:4	?	?					
6.0	295	3.17	66:5	?	?		7			
7.0	338	2.29	79:14	85	531					
			181:15	373						
8.0	396	3.32	67:3	244	389					
8.75	437	3.13	76:3	162	286			8	3.03	604
10.00	511	3.39	66:3	193	540					
			33:2	347						
10.50	576	7.41	164:5	147	540					
			82:2	416						
Side Entry 4										
0.50	30	3.43	27:1.5	124	679					
			35:2	194						
			53:3	260						
			18:1	401						
			18:0.5	454						
			159:4	463						
			18:1	503						
0.75	86	12.63	18:2	36	594					
			36:3	73						
			49:3	170						
			49:3	412						
			133:14	424						
1.0	170	18.57	136:20	136	227	6				
1.5	230	6.84			?					



(A) Cambridge Fiord Tidal Data
Predictions based on Clyde River -0.2m,heights x 1.5,time shift +0.43 hrs.



(B) McBeth Fiord Tidal Data
Predictions based on Clyde River -0.2m,heights x 1.0,time shift +2.23 hrs.



(C) Itibirlung Fiord Tidal Data
Predictions based on Clyde River -0.2m,heights x 1.0,time shift +3.2 hrs.

Figure 20.13

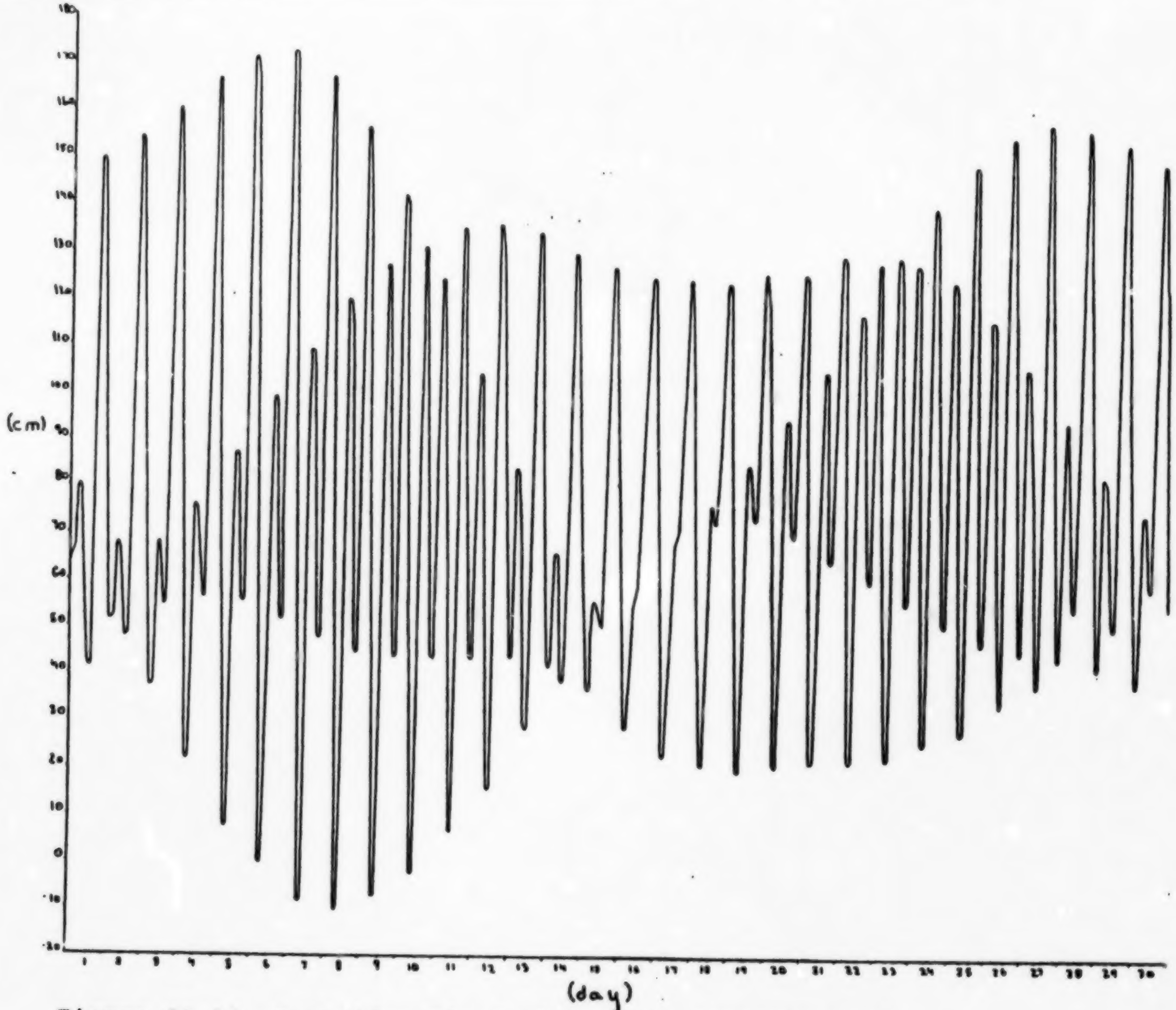


Figure 20.14 Cambridge Fiord tidal data, September 1983. Predicted from Clyde River (-0.2m from $Z_0 \times 1.5$, 0.0 time shift).

Tidal predictions based on 1983 September, October observations at Clyde River.

Place	Large Tides		Average Tides		Mean
	Higher H.W.	Lower L.W.	Higher H.W.	Lower L.W.	Sea Level
	(cm)	(cm)	(cm)	(cm)	(cm)
Cambridge Fiord	179	-7	144	21	83
McBeth Fiord	119	-4	96	14	55
Itirbilung Fiord	119	-4	96	14	55